

SECTION 013113

PROJECT COORDINATION MEETING

1. PROJECT COORDINATION MEETING

- A. An on-site project coordination meeting will be held on a biweekly basis throughout the project construction period.

2. ATTENDANCE

- A. Attendance at the project coordination meeting is mandatory of each Contractor or major supplier on the project.
- B. The representative of the Contractor shall be the Project Manager and field superintendent unless a substitute representative has been approved by the Construction Manager.
- C. Contractor will begin attending the Project Coordination Meetings at least 4 weeks prior to mobilization on site and will continue until the Contractor has fulfilled the obligations of his Contract.

3. AGENDA

- A. The Construction Manager will set the agenda for the biweekly Project Coordination Meeting.
- B. At a minimum, the Contractor shall be prepared to discuss the following:
 - 1. Actual vs. as planned progress for the prior two-week period.
 - 2. Planned construction activities for the next four weeks.
 - 3. Contract document clarifications.
 - 4. Coordination items with other contractors.
 - 5. Quality Control.
 - 6. Recently issued change orders.
 - 7. Potential change orders.
 - 8. Submittals and shop drawings.
 - 9. Other items requiring Construction Manager's attention.

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SECTION 013119

PRE-INSTALLATION MEETINGS

1. PRE-INSTALLATION MEETINGS

- A. An on-site pre-installation meeting will be held at least two weeks prior to commencement of installation of work.

2. ATTENDANCE

- A. Attendance at the pre-installation meeting is mandatory of each Contractor and/or major supplier as required for each specific meeting listed below.

- B. The following individuals shall attend these meetings:

- Contractors' Project Manager
- Contractors' Field Superintendent
- Contractors' Safety Representative (as needed)
- Key Subcontractors, Suppliers, and Vendors
- EDiS Project Manager
- EDiS Field Manager
- EDiS Safety Director (as needed)
- EDiS MEP Specialist (as needed)
- Owner's Representative (as needed)
- Architect/Engineer (as needed)
- Governmental Agency Representatives (as needed)
- Testing/Inspection Agency Representatives (as needed)
- Utility Company Representatives (as needed)

3. SUBMITTALS

- A. Each contractor is responsible to have all submittals and mock-ups, as related to the pre-installation meeting scope of work, submitted and approved prior to commencement of the pre-installation meeting.

4. LIST OF REQUIRED MEETINGS

- Selective Demolition
- Doors/Frames/Hardware
- Interior Glass and Glazing
- Finish Carpentry & Millwork
- Acoustical Ceilings/Acoustical Wall Panels
- Paint and VWC
- Flooring (VCT, Carpet)
- Operable Partitions
- Partition Walls

- Metal Studs
- Drywall
- Insulation
- Doors/Frames/Hardware
- Fire Protection
 - Fire Sprinkler Systems
 - Fire Alarm Systems
- MEP Coordination
 - Mechanical Piping Roughin
 - Plumbing Roughin
 - Insulation
 - Electrical Roughin
 - Electrical – Bonding, grounding, lightning protection
 - Automatic Temperature Controls
 - Commissioning
- Voice/Data Low Voltage Wiring
- Security System
- Audio-Visual Equipment
- Owner Furnished Equipment
- Final Cleaning

5. AGENDA

- A. At a minimum, the Contractor shall be prepared to discuss the items as listed on the agenda template shown on the following page:

PROJECT: CUSTOMS HOUSE RENOVATION AND ADDITION

(Insert Phase of Work)

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COORDINATION WITH OTHER TRADES

ACTION ITEMS AND RESPONSIBILITY

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SECTION 013125

WEB-BASED PROJECT MANAGEMENT SYSTEM

1. GENERAL PROVISIONS

- A. The general provisions of the Contract, including the Conditions of the Contract (General, Supplementary and other Conditions, if any) and Division 1 as appropriate, apply to the Work specified in this Section.
- B. Refer to provisions in AIA Document A232 – 2019 EDITION, GENERAL CONDITIONS OF THE CONTRACT FOR CONSTRUCTION, for requirements in addition to those specified in Division 1.
- C. Refer to Scope Information Sheets for all contracts bound in the Project Manual under Section 011100 - SUMMARY OF WORK. The Scope Information Sheets describe generally the work included in each contract, but the work is not necessarily limited to that described.
- D. All Contractors shall use Internet/Web-based project management software to transmit documents, track, and otherwise manage this project.
- E. Use of this project management software will not change any contractual responsibilities of the construction team members.

2. DEFINITIONS

- A. System: A real time web-based software that shares data, translates data, organizes data, facilitates communication, archives actions, and offers scheduling prompts to identified Users.
- B. Users: Authorized participants of this project furnished with a unique password and authorized to access the system to view/input/export data. Owner, Construction Manager, Architect, and the Contractors are all Users. Other Users may be added as necessary.
- C. Contacts: Entities identified to automatically receive specific transmissions or entities selected to receive specific information sent by the system through to an e-mail address.
- D. Signees: Those individuals identified, by the Contractors, authorized to sign change orders and payment applications via electronic signature. This electronic signature is as contractually binding as an original signature on paper.

3. USE OF SYSTEM

- A. The use of the system is mandatory for the documentation of the transmittal of all non-oral information, even if the actual transmission of the information is by another means.
- B. The use of the system will be mandatory by the Contractors to send, retrieve, and respond to data.

- C. In addition to this web-based project management system, the Contractors will be required to use electronic mail (email) for day-to-day communication and correspondence. Email will be the primary means of transmitting written communication (i.e. meeting minutes, draft pay applications, etc.).

4. QUALITY ASSURANCE

- A. A three-hour training session in the use of the software for this project will be offered by the Construction Manager at a location convenient to the project site. Attendance by one member of each Contractor's organization is mandatory. Additional attendees may enroll based on availability of training space. All attendees must have a working knowledge of computers. Training can not begin until three working days after the receipt of the submittals indicated below.
- B. Technical assistance will be provided by on-line help, email, or telephone for all Users through-out the life of the project.

5. SUBMITTALS

- A. Submit to the Construction Manager, within 5 days following the receipt of the letter of intent to award, in an electronic template, the following:
1. Electronic logo of organization (as needed)
 2. Names, mailing address and electronic address of its Users and Contacts.
 3. Designation the role/responsibility for each User

6. SOFTWARE AND HARDWARE REQUIREMENTS

- A. Each User shall provide and maintain a computer with high-speed internet access and an email address. The computer shall have a high-speed internet browser (Internet Explorer 8.0 or higher, Firefox version 3.6.12 or higher, Google Chrome or Safari version 5.0 or higher) and a high speed cable Internet access, high speed DSL or T1 line.
- B. License(s) to Use System - Each Contractor will be provided unlimited licenses to use the system for this project. Each license will allow secure unlimited usage from the notice to proceed until the original contract completion date.

7. SYSTEM DESCRIPTION

- A. The web-based project management system is a "secure, real-time, interactive, centralized database" specifically established and maintained for the management of this construction project. The product is designed to facilitate communication and improve the time management of its users by facilitating the sharing of information. Information will be available 24/7, from any computer meeting the specifications listed above. The information is fully protected. The electronic platform allows information to be transmitted across the internet reducing printing and postage costs and the time associated with such activities.
- B. The system contains a directory of the project participants.

- C. The system includes templates, with the CM's letterhead, for each document created inside the system. The template allows the use of "pull down" menus to complete significant portions of each document.
- D. The system allows the templates (and attached documents created outside the system) to be distributed to Users and Contacts.
- E. The System contains "translation software" to permit the viewing (and marking) of documents created outside the system. The system can view documents created by different software programs and can deliver images of its translation to any computer meeting the criteria listed above.
- F. The system can be personalized by the Construction Manager to automatically send e-mail notices upon issuance of certain documents if such a practice facilitates the User's business needs.
- G. The system is the product of **Building Blok, LLC** (www.buildingblok.com) and will be continuously updated.
- H. The Construction Manager will administer the Building Blok User accounts for this project.

8. DOCUMENTS CREATED INSIDE THE SYSTEM

- A. The following documents shall be created on templates inside the system.
 - 1. Transmittals for submittals processed in the system. The transmittals are automatically created by the system when the submittal is uploaded.
 - 2. Submittal Register showing all of the submittals required of the contract, assigned to each Contractor.
 - 3. Submittal Log: The CM will maintain submittal log after it is initialized.
 - 4. RFI (Requests for Information)
 - 5. Change Orders
 - 6. RFP (Requests for Proposal)
 - 7. ASI (Architect's Supplemental Instructions)
 - 8. Tasks & Memos as determined by the CM
 - 9. Payment Applications
 - 10. Closeout Tracking Log
- B. The following documents may, at each Users option, be created on the system.
 - 1. Morning & Afternoon Activity Reports generated by the system
 - 2. E-mails: Contacts that do not have access to the system may be sent information from the system, by the system.
 - 3. Reports of information on the system
 - 4. Project Notices: "Broadcast" messages can be sent to other Users system entry screen.

9. DOCUMENTS CREATED OUTSIDE THE SYSTEM AND DISTRIBUTED BY THE SYSTEM

- A. The following documents are expected to be created outside the system and distributed through the system. The actual documents may be scanned or electronically attached to the transmittal.
1. Technical Submittals: Shop drawings, product data, testing reports, certifications, installation instructions, operation & maintenance manuals, will be submitted and distributed through the system. The Architect will return all submissions through the system electronically. The Construction Manager will distribute submittals (after Architect's action) electronically. Contractors may download and distribute submittals to their subcontractors and suppliers or elect to print paper copies for distribution, or both.
 2. Photographs: Digital photographs and scanned images can be loaded onto the system and shared.
 3. Schedule of Values/ Payment Applications: (The "pencil" review of these documents can occur inside the system).
 4. Change Orders: (The "pencil" review of these documents can occur inside the system.)
 5. Schedules: The schedule document(s) will be available for review on the system.
 6. Data created in other software may be uploaded to the system electronically.

10. DOCUMENTS CREATED OUTSIDE THE SYSTEM AND DISTRIBUTED OUTSIDE THE SYSTEM

- A. The following documents are expected to be created outside the system and distributed outside the system. The actual documents may be scanned or electronically attached to the transmittal.
1. Schedules: The Construction Manager will develop the Master Schedule through Microsoft Project 2003. The schedule will be distributed either through hard copies at meetings or through email.
 2. Product samples, color samples, physical samples are still required to be provided per the technical specifications, however, the transmittal documenting the distribution shall be done inside the system and submitted electronically and printed to accompany the actual submission.
 3. Meeting minutes will be created using Microsoft Word 2003 and distributed through hard copies at meetings or through email.
 4. AIA closeout documents, which require an "original" signature, will be created and distributed outside the system.

END OF SECTION

SECTION 01 32 00

CONSTRUCTION PROGRESS DOCUMENTATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes administrative and procedural requirements for documenting the progress of construction during performance of the Work, including the following:

1. Startup construction schedule.
2. Contractor's construction schedule.
3. Construction schedule updating reports.
4. Construction reports.
5. Material location reports.
6. Site condition reports.
7. Special reports.

- B. Related Requirements:

1. Section 01 33 00 "Submittal Procedures" for submitting schedules and reports.
2. Section 01 40 00 "Quality Requirements" for submitting a schedule of tests and inspections.

1.3 DEFINITIONS

- A. Activity: A discrete part of a project that can be identified for planning, scheduling, monitoring, and controlling the construction project. Activities included in a construction schedule consume time and resources.

1. Critical Activity: An activity on the critical path that must start and finish on the planned early start and finish times.
2. Predecessor Activity: An activity that precedes another activity in the network.
3. Successor Activity: An activity that follows another activity in the network.

- B. Baseline: The complete schedule that has been set prior to the beginning of the project. The project baseline is to be saved and restricted from being changed after the project has begun. The schedule baseline is to be saved in such a manner that it can be displayed for comparison to the current live schedule.

- C. Cost Loading: The allocation of the schedule of values for the completion of an activity as scheduled. The sum of costs for all activities must equal the total Contract Sum unless otherwise approved by Architect.
- D. CPM: Critical path method, which is a method of planning and scheduling a construction project where activities are arranged based on activity relationships. Network calculations determine when activities can be performed and the critical path of Project.
- E. Critical Path: The longest connected chain of interdependent activities through the network schedule that establishes the minimum overall Project duration and contains no float.
- F. Event: The starting or ending point of an activity.
- F. Float: The measure of leeway in starting and completing an activity.
 - 1. Float time belongs to Owner.
 - 2. Free float is the amount of time an activity can be delayed without adversely affecting the early start of the successor activity.
 - 3. Total float is the measure of leeway in starting or completing an activity without adversely affecting the planned Project completion date.
- G. Resource Loading: The allocation of manpower and equipment necessary for the completion of an activity as scheduled.

1.4 INFORMATIONAL SUBMITTALS

- A. Format for Submittals: Submit required submittals in the following format:
 - 1. Working electronic copy of schedule file, where indicated.
 - 2. PDF electronic file.
- B. Startup construction schedule.
 - 1. Approval of cost-loaded, startup construction schedule will not constitute approval of schedule of values for cost-loaded activities.
- C. Startup Network Diagram: Of size required to display entire network for entire construction period. Show logic ties for activities.
- D. Contractor's Construction Schedule: Initial schedule, of size required to display entire schedule for entire construction period.
 - 1. Submit a working electronic copy of schedule, using software indicated, and labeled to comply with requirements for submittals. Include type of schedule (initial or updated) and date on label.
- E. CPM Reports: Concurrent with CPM schedule, submit each of the following reports. Format for each activity in reports shall contain activity number, activity description, cost and resource

loading, original duration, remaining duration, early start date, early finish date, late start date, late finish date, and total float in calendar days.

1. Activity Report: List of all activities sorted by activity number and then early start date, or actual start date if known.
2. Logic Report: List of preceding and succeeding activities for all activities, sorted in ascending order by activity number and then early start date, or actual start date if known.
3. Total Float Report: List of all activities sorted in ascending order of total float.
4. Earnings Report: Compilation of Contractor's total earnings from commencement of the Work until most recent Application for Payment.

F. Construction Schedule Updating Reports: Submit with Applications for Payment.

G. Construction Reports: Submit at weekly intervals.

H. Material Location Reports: Submit at weekly intervals.

I. Site Condition Reports: Submit at time of discovery of differing conditions.

J. Special Reports: Submit at time of unusual event.

K. Qualification Data: For scheduling consultant.

1.5 QUALITY ASSURANCE

A. Scheduling Consultant Qualifications: An experienced specialist in CPM scheduling and reporting, with capability of producing CPM reports and diagrams within 24 hours of Architect's request.

B. Prescheduling Conference: Conduct conference at Project site to comply with requirements in Section 01 31 00 "Project Management and Coordination." Review methods and procedures related to the preliminary construction schedule and Contractor's construction schedule, including, but not limited to, the following:

1. Review software limitations and content and format for reports.
2. Verify availability of qualified personnel needed to develop and update schedule.
3. Review delivery dates for Owner-furnished products.
4. Review schedule for work of Owner's separate contracts.
5. Review submittal requirements and procedures.
6. Review time required for review of submittals and resubmittals.
7. Review requirements for tests and inspections by independent testing and inspecting agencies.
8. Review time required for Project closeout and Owner startup procedures.
9. Review and finalize list of construction activities to be included in schedule.
10. Review procedures for updating schedule.

1.6 COORDINATION

- A. Coordinate Contractor's construction schedule with the schedule of values submittal schedule, progress reports, payment requests, and other required schedules and reports.
 - 1. Secure time commitments for performing critical elements of the Work from entities involved.
 - 2. Coordinate each construction activity in the network with other activities and schedule them in proper sequence.

PART 2 - PRODUCTS

2.1 CONTRACTOR'S CONSTRUCTION SCHEDULE, GENERAL

- A. Time Frame: Extend schedule from date established for the Notice of Award to date of final completion.
 - 1. Contract completion date shall not be changed by submission of a schedule that shows an early completion date, unless specifically authorized by Change Order.
- B. Activities: Treat each story or separate area as a separate numbered activity for each main element of the Work. Comply with the following:
 - 1. Activity Duration: Define activities so no activity is longer than 20 days, unless specifically allowed by Architect.
 - 2. Procurement Activities: Include procurement process activities for the following long lead items and major items, requiring a cycle of more than 60 days, as separate activities in schedule. Procurement cycle activities include, but are not limited to, submittals, approvals, purchasing, fabrication, and delivery.
 - 3. Submittal Review Time: Include review and resubmittal times indicated in Section 01 33 00 "Submittal Procedures" in schedule. Coordinate submittal review times in Contractor's construction schedule with submittal schedule.
 - 4. Startup and Testing Time: Include no fewer than 15 days for startup and testing.
 - 5. Substantial Completion: Indicate completion in advance of date established for Substantial Completion, and allow time for Architect's administrative procedures necessary for certification of Substantial Completion.
 - 6. Punch List and Final Completion: Include not more than 30 days for completion of punch list items and final completion.
- C. Constraints: Include constraints and work restrictions indicated in the Contract Documents and as follows in schedule, and show how the sequence of the Work is affected.
 - 1. Phasing: Arrange list of activities on schedule by phase.
 - 2. Work under More Than One Contract: Include a separate activity for each contract.
 - 3. Work by Owner: Include a separate activity for each portion of the Work performed by Owner.

4. Products Ordered in Advance: Include a separate activity for each product. Include delivery date indicated in Section 01 10 00 "Summary of Work." Delivery dates indicated stipulate the earliest possible delivery date.
 5. Owner-Furnished Products: Include a separate activity for each product. Include delivery date indicated in Section 01 100 0 "Summary of Work." Delivery dates indicated stipulate the earliest possible delivery date.
 6. Work Restrictions: Show the effect of the following items on the schedule:
 - a. Coordination with existing construction.
 - b. Limitations of continued occupancies.
 - c. Uninterruptible services.
 - d. Partial occupancy before Substantial Completion.
 - e. Use of premises restrictions.
 - f. Provisions for future construction.
 - g. Seasonal variations.
 - h. Environmental control.
 7. Work Stages: Indicate important stages of construction for each major portion of the Work, including, but not limited to, the following:
 - a. Subcontract awards.
 - b. Submittals.
 - c. Purchases.
 - d. Mockups.
 - e. Fabrication.
 - f. Sample testing.
 - g. Deliveries.
 - h. Installation.
 - i. Tests and inspections.
 - j. Adjusting.
 - k. Curing.
 - l. Building flush-out.
 - m. Startup and placement into final use and operation.
 8. Construction Areas: Identify each major area of construction for each major portion of the Work. Indicate where each construction activity within a major area must be sequenced or integrated with other construction activities to provide for the following:
 - a. Structural completion.
 - b. Temporary enclosure and space conditioning.
 - c. Permanent space enclosure.
 - d. Completion of mechanical installation.
 - e. Completion of electrical installation.
 - f. Substantial Completion.
- D. Milestones: Include milestones indicated in the Contract Documents in schedule, including, but not limited to, the Notice to Proceed, Substantial Completion, and final completion.

- E. Cost Correlation: Superimpose a cost correlation timeline, indicating planned and actual costs. On the line, show planned and actual dollar volume of the Work performed as of planned and actual dates used for preparation of payment requests.
 - 1. See Section 01 29 00 "Payment Procedures" for cost reporting and payment procedures.
- F. Upcoming Work Summary: Prepare summary report indicating activities scheduled to occur or commence prior to submittal of next schedule update. Summarize the following issues:
 - 1. Unresolved issues.
 - 2. Unanswered Requests for Information.
 - 3. Rejected or unreturned submittals.
 - 4. Notations on returned submittals.
 - 5. Pending modifications affecting the Work and Contract Time.
- G. Recovery Schedule: When periodic update indicates the Work is 14 or more calendar days behind the current approved schedule, submit a separate recovery schedule indicating means by which Contractor intends to regain compliance with the schedule. Indicate changes to working hours, working days, crew sizes, and equipment required to achieve compliance, and date by which recovery will be accomplished.
- H. Computer Scheduling Software: Prepare schedules using current version of a program that has been developed specifically to manage construction schedules.
 - 1. Use Microsoft Project or Primavera by Oracle, for Windows operating system.

2.2 STARTUP CONSTRUCTION SCHEDULE

- A. Bar-Chart Schedule: Submit startup, horizontal, bar-chart-type construction schedule within seven days of date established for the Notice of Award.
- B. Preparation: Indicate each significant construction activity separately. Identify first workday of each week with a continuous vertical line. Outline significant construction activities for first 90 days of construction. Include skeleton diagram for the remainder of the Work and a cash requirement prediction based on indicated activities.

2.3 CONTRACTOR'S CONSTRUCTION SCHEDULE (GANTT CHART)

- A. Gantt-Chart Schedule: Submit a comprehensive, fully developed, horizontal, Gantt-chart-type, Contractor's construction schedule within 30 days of date established for the Notice of Award. Base schedule on the startup construction schedule and additional information received since the start of Project.
- B. Preparation: Indicate each significant construction activity separately. Identify first workday of each week with a continuous vertical line.

1. For construction activities that require three months or longer to complete, indicate an estimated completion percentage in 10 percent increments within time bar.

2.4 CONTRACTOR'S CONSTRUCTION SCHEDULE (CPM SCHEDULE)

- A. General: Prepare network diagrams using AON (activity-on-node) format.
- B. Startup Network Diagram: Submit diagram within 14 days of date established for the Notice of Award. Outline significant construction activities for the first 90 days of construction. Include skeleton diagram for the remainder of the Work and a cash requirement prediction based on indicated activities.
- C. CPM Schedule: Prepare Contractor's construction schedule using a cost- and resource-loaded, time-scaled CPM network analysis diagram for the Work.
 1. Develop network diagram in sufficient time to submit CPM schedule so it can be accepted for use no later than 30 days after date established for the Notice of Award.
 - a. Failure to include any work item required for performance of this Contract shall not excuse Contractor from completing all work within applicable completion dates, regardless of Architect's approval of the schedule.
 2. Conduct educational workshops to train and inform key Project personnel, including subcontractors' personnel, in proper methods of providing data and using CPM schedule information.
 3. Establish procedures for monitoring and updating CPM schedule and for reporting progress. Coordinate procedures with progress meeting and payment request dates.
 4. Use "one workday" as the unit of time for individual activities. Indicate nonworking days and holidays incorporated into the schedule in order to coordinate with the Contract Time.
- D. CPM Schedule Preparation: Prepare a list of all activities required to complete the Work. Using the startup network diagram, prepare a skeleton network to identify probable critical paths.
 1. Activities: Indicate the estimated time duration, sequence requirements, and relationship of each activity in relation to other activities. Include estimated time frames for the following activities:
 - a. Preparation and processing of submittals.
 - b. Mobilization and demobilization.
 - c. Purchase of materials.
 - d. Delivery.
 - e. Fabrication.
 - f. Utility interruptions.
 - g. Installation.
 - h. Work by Owner that may affect or be affected by Contractor's activities.
 - i. Testing.
 - j. Punch list and final completion.
 - k. Activities occurring following final completion.

2. Critical Path Activities: Identify critical path activities, including those for interim completion dates. Scheduled start and completion dates shall be consistent with Contract milestone dates.
3. Processing: Process data to produce output data on a computer-drawn, time-scaled network. Revise data, reorganize activity sequences, and reproduce as often as necessary to produce the CPM schedule within the limitations of the Contract Time.
4. Format: Mark the critical path. Locate the critical path near center of network; locate paths with most float near the edges.
 - a. Subnetworks on separate sheets are permissible for activities clearly off the critical path.
5. Cost- and Resource-Loading of CPM Schedule: Assign cost to construction activities on the CPM schedule. Do not assign costs to submittal activities. Obtain Architect's approval prior to assigning costs to fabrication and delivery activities. Assign costs under main subcontracts for testing and commissioning activities, operation and maintenance manuals, punch list activities, Project record documents, and demonstration and training (if applicable), in the amount of 5 percent of the Contract Sum.
 - a. Each activity cost shall reflect an appropriate value subject to approval by Architect.
 - b. Total cost assigned to activities shall equal the total Contract Sum.
- E. Contract Modifications: For each proposed contract modification and concurrent with its submission, prepare a time-impact analysis using a network fragment to demonstrate the effect of the proposed change on the overall project schedule.
- F. Initial Issue of Schedule: Prepare initial network diagram from a sorted activity list indicating straight "early start-total float." Identify critical activities. Prepare tabulated reports showing the following:
 1. Contractor or subcontractor and the Work or activity.
 2. Description of activity.
 3. Main events of activity.
 4. Immediate preceding and succeeding activities.
 5. Early and late start dates.
 6. Early and late finish dates.
 7. Activity duration in workdays.
 8. Total float or slack time.
 9. Average size of workforce.
 10. Dollar value of activity (coordinated with the schedule of values).
- G. Schedule Updating: Concurrent with making revisions to schedule, prepare tabulated reports showing the following:
 1. Identification of activities that have changed.
 2. Changes in early and late start dates.
 3. Changes in early and late finish dates.
 4. Changes in activity durations in workdays.

5. Changes in the critical path.
6. Changes in total float or slack time.
7. Changes in the Contract Time.

H. Value Summaries: Prepare two cumulative value lists, sorted by finish dates.

1. In first list, tabulate activity number, early finish date, dollar value, and cumulative dollar value.
2. In second list, tabulate activity number, late finish date, dollar value, and cumulative dollar value.
3. In subsequent issues of both lists, substitute actual finish dates for activities completed as of list date.
4. Prepare list for ease of comparison with payment requests; coordinate timing with progress meetings.
 - a. In both value summary lists, tabulate "actual percent complete" and "cumulative value completed" with total at bottom.
 - b. Submit value summary printouts one week before each regularly scheduled progress meeting.

2.5 REPORTS

A. Construction Reports: Prepare construction reports recording the following information concerning events at Project site:

1. List of subcontractors at Project site.
2. List of separate contractors at Project site.
3. Approximate count of personnel at Project site.
4. Equipment at Project site.
5. Material deliveries.
6. High and low temperatures and general weather conditions, including presence of rain or snow.
7. Accidents.
8. Meetings and significant decisions.
9. Unusual events (see special reports).
10. Stoppages, delays, shortages, and losses.
11. Meter readings and similar recordings.
12. Emergency procedures.
13. Orders and requests of authorities having jurisdiction.
14. Change Orders received and implemented.
15. Construction Change Directives received and implemented.
16. Services connected and disconnected.
17. Equipment or system tests and startups.
18. Partial completions and occupancies.
19. Substantial Completions authorized.

- B. Material Location Reports: At monthly intervals, prepare and submit a comprehensive list of materials delivered to and stored at Project site. List shall be cumulative, showing materials previously reported plus items recently delivered. Include with list a statement of progress on and delivery dates for materials or items of equipment fabricated or stored away from Project site. Indicate the following categories for stored materials:
 - 1. Material stored prior to previous report and remaining in storage.
 - 2. Material stored prior to previous report and since removed from storage and installed.
 - 3. Material stored following previous report and remaining in storage.
- C. Site Condition Reports: Immediately on discovery of a difference between site conditions and the Contract Documents, prepare and submit a detailed report. Submit with a Request for Information. Include a detailed description of the differing conditions, together with recommendations for changing the Contract Documents.

2.6 SPECIAL REPORTS

- A. General: Submit special reports directly to Owner within one day(s) of an occurrence. Distribute copies of report to parties affected by the occurrence.
- B. Reporting Unusual Events: When an event of an unusual and significant nature occurs at Project site, whether or not related directly to the Work, prepare and submit a special report. List chain of events, persons participating, response by Contractor's personnel, evaluation of results or effects, and similar pertinent information. Advise Owner in advance when these events are known or predictable.

PART 3 - EXECUTION

3.1 CONTRACTOR'S CONSTRUCTION SCHEDULE

- A. Contractor's Construction Schedule Updating: At monthly intervals, update schedule to reflect actual construction progress and activities. Issue schedule one week before each regularly scheduled progress meeting.
 - 1. Revise schedule immediately after each meeting or other activity where revisions have been recognized or made. Issue updated schedule concurrently with the report of each such meeting.
 - 2. Include a report with updated schedule that indicates every change, including, but not limited to, changes in logic, durations, actual starts and finishes, and activity durations.
 - 3. As the Work progresses, indicate final completion percentage for each activity.
- B. Distribution: Distribute copies of approved schedule to Architect Owner, separate contractors, testing and inspecting agencies, and other parties identified by Contractor with a need-to-know schedule responsibility.
 - 1. Post copies in Project meeting rooms and temporary field offices.

2. When revisions are made, distribute updated schedules to the same parties and post in the same locations. Delete parties from distribution when they have completed their assigned portion of the Work and are no longer involved in performance of construction activities.

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SECTION 013216

CONSTRUCTION SCHEDULE

1. PRE-BID CONSTRUCTION SCHEDULE

- A. Time is a critical element of this Project. By entering a bid, the Contractor agrees to adhere to the intermediate Milestone Dates and Dates of Substantial and Final Completion established herein. The Contractor also understands that all work must be performed in an orderly and closely coordinated sequence in order to achieve the specified Milestones and Completion Dates, and the Contractor hereby agrees to perform his work in conformance with the Pre-Bid Construction Schedule established herein, or with the then current and approved Project Construction Schedule as amended from time to time by the Construction Manager.
- B. The Pre-Bid Construction Schedule is a milestone schedule with durations that identify portions of the project that must be completed. This schedule includes allowances for time lost due to adverse and abnormal weather conditions, other than floods, hurricanes, tornadoes, lightening and other like acts of God. The Contractor understands and agrees that it shall not be entitled to any extensions of the Contract Time or adjustment to the Contract Sum, except as allowed in the General Conditions of the Contract for Construction. The Contractor further acknowledges that the Work may be required to be performed during the winter season, that conditions during this season may be adverse and abnormal, but that such conditions will not be the basis for an extension of the Contract Time or adjustment to the Contract Sum. By submitting a bid, each Contractor is certifying that they can complete their work within the durations, or less time, outlined in the milestone schedule and its bid includes any and all costs associated with the schedule. This includes one Contractor completing their work in conjunction with another Contractor's work (i.e. electrical conduits installed in CMU walls). Each Contractor agrees to provide sufficient labor, crew size, equipment and/or work overtime, weekends, or shift-work as necessary to meet the activity durations on this schedule and subsequently the latest coordinated Project Construction Schedule.

2. SCHEDULING OF THE WORK AFTER AWARD OF CONTRACT

- A. After award of Contract, or issuance of a Notice to Proceed, the Contractor will meet with the Construction Manager to review the Pre-Bid Construction Schedule, and the overall project plan for construction. Following the above review, the Contractor will meet with each subcontractor and supplier to view the detailed plans for performing his Work. Following these meetings and within fourteen (14) days after award of the Contract or issuance of a Notice to Proceed, the Contractor shall prepare and submit for the Construction Manager's approval a Work Schedule providing for the expeditious, timely and practical execution of the Work. The Contractor's Work Schedule shall include activity descriptions and durations for shop drawings, fabrication, delivery, and installation. The Contractor's Work Schedule shall be organized by Area, Building, Phase, and/or Floor as required by the Construction Manager. If the Construction Manager so requests, the Contractor shall provide adequate explanation regarding crew sizes, production rates and similar data used to arrive at the durations and sequences. If the Contractor fails to provide a work schedule for their activities then they will be held to the Project Construction Schedule developed and updated by the Construction Manager.

- B. The Construction Manager shall review the Contractor's Work Schedule, coordinate it with the separate work by other contractors, the Owner, and the Construction Manager, and after coordination, shall incorporate it into the approved Project Construction Schedule.
- C. After all Contractors submit their Work Schedules and the schedules have been incorporated into the overall Project Construction Schedule a Schedule Charrette will be held by the Construction Manager. Each Contractor is required to participate in the Schedule Charrette in order to produce a coordinated Project Construction Schedule. The Construction Manager will have the final authority concerning the sequence of work, priorities or work, and activity durations. The approved coordinated Project Construction Schedule shall be issued to the Contractors and each Contractor shall perform their Work in conformity therewith.
- C. The Contractor shall submit proposed schedule revisions and obtain the written approval of the Construction Manager therefore before deviating from the Project Construction Schedule.
- D. The Construction Manager will incorporate approved schedule revisions into the Project Construction Schedule and shall otherwise update and revise the Project Construction Schedule as the Construction Manager, at his sole discretion, deems necessary. Each Contractor acknowledges that Construction Manager may modify, change, or alter the sequence, duration, start dates, completion dates to maintain the progress of the work. Contractor agrees to perform the work in accordance with the revised schedules and that modification of the schedule or sequence of the work by the Construction Manager shall not be the basis of any claim by the Contractor for damages or costs.
- E. Weather Delays: The project substantial completion date, shall only be adjusted due to extreme weather conditions that are above and beyond the following "Adverse Weather Days" already accounted for in the Pre-Bid Construction Schedule. These adverse weather days are based on a seven day week and come from the DelDOT Standards:
 - a. January (12), February (10), March (5), April (5), May (4), June (2), July (4), August (3), September (4), October (3), November (2), and December (6).
 - b. Time extension due to weather must be related to critical path activities.
 - c. Delays due to weather must be reported by the Contractor on the day they occur on the Contractor's daily report.
 - d. Any time lost during the work week must be made up the same week by overtime and/or working weekends. The Owner will not be responsible for additional costs for overtime.

3. ADHERENCE TO THE SCHEDULE

- A. The Contractor shall start each part of its Work on the date designated for start in the approved Project Construction Schedule unless advised by the Construction Manager. The Contractor shall carry the Work forward expeditiously with adequate forces, equipment, and materials, and shall complete each part of his work on or before the date designated in the approved Project Construction Schedule.

- B. If the Construction Manager determines that the Contractor is behind schedule, the Construction Manager shall have the right to require that the Contractor take steps, at the Contractor's expense, to accelerate its Work. Such steps shall include increases in manpower, equipment, and materials and/or overtime as the Construction Manager may deem necessary. If any work is not started or completed within five (5) calendar days of the schedule date in the latest Project Construction Schedule, the Construction Manager shall have the right to direct the Contractor to expedite their work by whatever means the Construction Manager deems necessary to regain the schedule, without additional compensation to the Contractor. If any work falls behind schedule more than ten (10) days, the Construction Manager shall have the right to perform the work or have the work performed by whatever means the Construction Manager deems necessary. The costs incurred by the Construction Manager in order to "maintain the Project Construction Schedule" shall be reimbursed by the Contractor or Contractors causing the delay. If the Contractor fails to comply with the Construction Manager's instructions relating to improved rate of progress, the Contractor may be held in default under the appropriate provisions of the General Conditions of the Contract.
- C. Each Contractor shall, if directed by the Construction Manager, provide the Construction Manager a two-week look ahead of anticipated manpower showing the number of men, classification, and anticipated work.
- D. Each Contractor must schedule their manpower to work on all available work at a given time. Contractors must not assume that they have an entire work area available at one time or exclusive to their work. Working simultaneously in and around other trades is required. Therefore, if an area of the building is ready for the Contractor's work to begin or continue the Contractor must have manpower onsite working.
- E. If a Contractor misses any portion of a workday due to weather, manpower, lack of materials, failure to plan, or scheduling conflicts, they must make-up this lost time on overtime or Saturday. If two or more days are lost in the same work week, the Contractor must work overtime, the immediate Saturday and the Saturdays following the week to make up the lost days. Failure to provide sufficient manpower during the normal week days may result in charges for supervision by EDiS Company, at the discretion of EDiS Company.
- F. All punchlist work and project closeout documentation shall be completed within twenty-one (21) calendar days of the Substantial Completion date. Any open punchlist items after this date will be completed by EDiS Company and back charged to the responsible Contractor.

END OF SECTION

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NOT FOR BIDDING PURPOSES

CUSTOMS HOUSE - RENOVATION AND ADDITION

MASTER SCHEDULE

ID	Task Name	Duration	Start	Finish	June 2025	July 2025	August 2025	September 2025	October 2025	November 2025	December 2025	January 2026
					9 14 19 24 29	4 9 14 19 24 29	3 8 13 18 23 28	2 7 12 17 22 27	2 7 12 17 22 27	1 6 11 16 21 26	1 6 11 16 21 26	31 5 10 15 20 25 30
1		1289 days?	Tue 3/1/22	Mon 2/8/27								
2	CITY OF WILMINGTON (CoW) - REGULATORY & AGENCY REVIEWS	478 days	Tue 3/1/22	Thu 12/28/23								
3	CM Selection Process	87 days	Wed 5/4/22	Thu 9/1/22								
7	CITY OF WILMINGTON - REVIEW PROCESS	478 days	Tue 3/1/22	Thu 12/28/23								
73	CUSTOM HOUSE - PROGRAMMING PHASE	156 days	Tue 3/1/22	Tue 10/4/22								
78	CUSTOM HOUSE - SCHEMATIC DESIGN PHASE 30%	157 days	Tue 10/4/22	Wed 5/10/23								
88	CUSTOM HOUSE - DESIGN DEVELOPMENT PHASE 60%	130 days	Tue 4/4/23	Mon 10/2/23								
99	CUSTOM HOUSE - CONSTRUCTION DOCUMENTS PHASE	315 days	Tue 4/4/23	Mon 6/17/24								
100	CUSTOM HOUSE - CONSTRUCTION DOCUMENT PHASE 100% (BID PACKAGE '1' - SELECTIVE DEMOLITION	97 days	Tue 4/4/23	Wed 8/16/23								
108	CUSTOM HOUSE - CONSTRUCTION DOCUMENT PHASE 100% (BID PACKAGE '2' - FOUNDATIONS, STEEL)	172 days	Tue 5/16/23	Wed 1/10/24								
117	CUSTOM HOUSE - CONSTRUCTION DOCUMENT PHASE 100% (BID PACKAGE '2.1' - SITEWORK, GRUOND IMPROVEMENT)	172 days	Tue 5/16/23	Wed 1/10/24								
126	CUSTOM HOUSE - CONSTRUCTION DOCUMENT PHASE 100% (BID PACKAGE '3' ENVELOPE, PRE-PURCHASE MEP EQUIPMENT)	184 days	Mon 7/24/23	Thu 4/4/24								
136	CUSTOM HOUSE - CONSTRUCTION DOCUMENT PHASE 100% (BID PACKAGE '4' MEP SYSTEMS & FIT OUT)	30 days	Mon 2/26/24	Fri 4/5/24								
144	CUSTOM HOUSE - CONSTRUCTION DOCUMENT PHASE 100% (BID PACKAGE '5' FF&E, A/V, IT	66 days	Mon 3/18/24	Mon 6/17/24								
149	CUSTOM HOUSE - BIDDING & AWARD ACTIVITIES	643 days	Tue 7/25/23	Fri 1/9/26	CUSTOM HOUSE - BIDDING & AWARD ACTIVITIES							
150	BID PACK '1' - SELECTIVE DEMOLITION	102 days	Tue 7/25/23	Wed 12/13/23								
163	BID PACK '2' - FOUNDATIONS, & STEEL	215 days	Thu 9/21/23	Wed 7/17/24								
178	BID PACK '2.1' - GROUND IMPROVEMENTS	151 days	Thu 1/11/24	Thu 8/8/24								
195	BID PACK '2.1A' - SITEWORK	89 days	Fri 6/28/24	Wed 10/30/24								
213	BID PACK '3' - BLDG ENVELOPE, PRE-PURCHASE MEP EQUIPMENT	178 days	Fri 4/5/24	Tue 1/10/24								
230	BID PACK '4' - MEP SYSTEMS & FIT OUT	286 days	Mon 4/8/24	Mon 5/12/25								
248	BID PACK '4A' - MEP SYSTEMS & FIT OUT RE-BID	83 days	Mon 5/5/25	Wed 8/27/25								
260	BID PACK '5' - FF&E, A/V, IT	139 days	Mon 6/30/25	Fri 1/9/26								
275	CUSTOM HOUSE - CONSTRUCTION ACTIVITIES	1289 days?	Tue 3/1/22	Mon 2/8/27	CUSTOM HOUSE - CONSTRUCTION ACTIVITIES							
276	EDIS Conducts Exploratory Demolition/Investigation	47 days	Tue 3/28/23	Wed 5/31/23								
277	CRITICAL SUBMITTALS	1 day?	Tue 3/1/22	Tue 3/1/22								
286	SELECTIVE DEMOLITION	816 days	Wed 7/5/23	Thu 8/20/26	SELECTIVE DEMOLITION							
287	Hazmat Abatement Contractor Mobilizes	1 day	Wed 7/5/23	Wed 7/5/23								
288	Hazmat Abatement of Existing Custom House	14 days	Thu 7/6/23	Tue 7/25/23								
289	Groundbreaking @1PM	1 day	Mon 12/18/23	Mon 12/18/23								
290	Mobilize	5 days	Mon 1/8/24	Fri 1/12/24								
291	Install Site Construction Fence	0 days	Wed 1/10/24	Wed 1/10/24								
292	Install Temporary Controls	50 days	Mon 1/8/24	Fri 3/15/24								
293	Demolition - PHASE 1	40 days	Mon 1/8/24	Fri 3/15/24								

CUSTOMS HOUSE - RENOVATION AND ADDITION

MASTER SCHEDULE

ID	Task Name	Duration	Start	Finish	June 2025	July 2025	August 2025	September 2025	October 2025	November 2025	December 2025	January 2026
					9 14 19 24 29	4 9 14 19 24 29	3 8 13 18 23 28	2 7 12 17 22 27	2 7 12 17 22 27	1 6 11 16 21 26	1 6 11 16 21 26	31 5 10 15 20 25 30
294	Demolition - PHASE 2	619 days	Fri 4/5/24	Thu 8/20/26	Demolition - PHASE 2							
295	Process Change order for ceiling demolition	5 days	Mon 4/8/24	Fri 4/12/24								
296	Resolve lead issue	75 days	Fri 4/5/24	Fri 7/26/24								
297	Plymouth lead abatement and courtroom ceiling demo	30 days	Mon 8/5/24	Fri 9/13/24								
298	Install shoring 1st floor up to 2nd floor	10 days	Fri 1/31/25	Thu 2/13/25								
299	Install pockets at masonry wall for thru bolting	0 days	Fri 2/7/25	Fri 2/7/25								
300	Install temporary bracing steel on exterior walls	16 days	Wed 2/19/25	Wed 3/12/25								
301	Temporary brace areas 1, 2, and 3	32 days	Thu 3/13/25	Fri 4/25/25								
302	Remove courtroom wood flooring	4 days	Tue 4/22/25	Fri 4/25/25								
303	Install temporary bracing at interior walls	10 days	Mon 4/28/25	Fri 5/9/25								
304	Demo brick arches in areas 1 and 2	19 days	Tue 5/27/25	Fri 6/20/25								
305	Steel Elevation Delays ASI#12	23 days	Fri 6/27/25	Tue 7/29/25								
306	Steel Contractor remove tie rods in Areas 1 and 2 one bay at time and install new steel one bay at a time	44 days	Mon 8/18/25	Fri 10/17/25								
307	Demo brick arches in area 3	11 days	Mon 10/20/25	Mon 11/3/25								
308	Steel Contractor remove tie rods in Area 3 one bay at time and install new steel one bay at a time	51 days	Wed 11/5/25	Wed 1/14/26								
309	Prep 3rd floor slab	3 days	Thu 1/15/26	Mon 1/19/26								
310	Weather Delays	10 days	Mon 1/26/26	Fri 2/6/26								
311	Pour 3rd floor slab	1 day	Wed 2/11/26	Wed 2/11/26								
312	Remove shoring in areas 7, 8, 9	3 days	Wed 2/18/26	Fri 2/20/26								
313	Remove Brownfield soil in areas 7, 8, 9	4 days	Fri 2/27/26	Wed 3/4/26								
314	Install footings in areas 7, 8, 9	4 days	Thu 3/5/26	Tue 3/10/26								
315	Install Underground Utilities	14 days	Wed 3/18/26	Mon 4/6/26								
316	Install Masonry Parging for Vapor Barrier	0 days	Thu 3/19/26	Fri 3/20/26								
317	Install Mud Mat at Existing Stair	12 days	Tue 4/7/26	Wed 4/22/26								
318	Miscellaneous Demo for Vapor Barrier	5 days	Thu 4/23/26	Mon 4/29/26								
319	Install stone, PVS, and SOG areas 7, 8, and 9	8 days	Tue 4/7/26	Mon 5/11/26								
320	Construct CMU Walls Level 1	7 days	Thu 5/21/26	Fri 5/29/26								
321	Install CMU Window In-Fills and set Bearing Plates in areas 7, 8, 9	3 days	Mon 6/1/26	Wed 6/3/26								
322	Install new steel in area 7, 8, 9	8 days	Mon 6/29/26	Wed 7/8/26								
323	Infill masonry above new steel in area 7, 8, 9	5 days	Thu 7/9/26	Wed 7/15/26								
324	Reinstall Shoring in areas 7, 8, 9	2 days	Thu 7/16/26	Fri 7/17/26								
325	Demo level 2 flooring, walls, door openings, wood sleepers, and rubble in areas 3, 4, 5, and 6	15 days	Mon 7/20/26	Fri 8/7/26								
326	Prep and pour concrete in areas 4, 5, and 6	5 days	Mon 8/10/26	Fri 8/14/26								
327	Remove shoring under 2nd floor	2 days	Wed 8/19/26	Thu 8/20/26								
328	PRELIMINARY SITEWORK	494 days	Fri 10/18/24	Thu 9/10/26								
362	NEW ADDITION	399 days	Mon 6/2/25	Fri 12/11/26								
363	BUILDING FOUNDATIONS & SLABS	215 days	Mon 6/2/25	Mon 3/30/26								
392	BUILDING STRUCTURE & ENVELOPE	246 days	Thu 10/16/25	Thu 9/24/26								

Customs House - Renovation and Add
Date: 14 JULY 2026

Task
Split

Milestone
Summary

Project Summary

Manual Summary

Start-only

Finish-only

Progress
Deadline

CUSTOMS HOUSE - RENOVATION AND ADDITION

MASTER SCHEDULE

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					9 14 19 24 29	4 9 14 19 24 29	3 8 13 18 23 28	2 7 12 17 22 27	2 7 12 17 22 27	1 6 11 16 21 26	1 6 11 16 21 26 31	5 10 15 20 25 30
393	AREA 1 - Erect steel	7 days	Thu 10/16/25	Fri 10/24/25								
394	AREA 1 - Detailing	60 days	Mon 10/27/25	Fri 1/16/26								
395	AREA 2 - Erect steel	10 days	Mon 10/27/25	Fri 11/7/25								
396	AREA 2 - Detailing	5 days	Mon 11/3/25	Fri 1/23/26								
397	AREA 3 - Erect steel	15 days	Fri 11/7/25	Fri 11/28/25								
398	AREA 3 - Detailing	5 days	Mon 12/1/25	Fri 1/30/26								
399	AREA 4 - Erect steel	6 days	Mon 12/1/25	Mon 12/8/25								
400	AREA 4 - Detailing	85 days	Tue 12/9/25	Mon 4/6/26								
401	Weather Delays	6 days	Mon 1/26/26	Mon 2/2/26								
402	AREA 5 - Erect steel	9 days	Tue 2/3/26	Fri 2/13/26								
403	AREA 5 - Detailing	32 days	Mon 2/9/26	Tue 3/31/26								
404	AREA 6 - Erect steel	10 days	Mon 2/16/26	Fri 2/27/26								
405	AREA 6 - Detailing	13 days	Wed 4/1/26	Fri 4/17/26								
406	Install Temporary Building Enclosure	14 days	Sat 1/31/26	Thu 2/19/26								
407	AREA 1-4 - Install slab on deck over garage level 2	0 days	Mon 2/9/26	Mon 2/16/26								
408	AREA 1-4 - Install insulation and topping slab over garage level 2	10 days	Tue 2/17/26	Mon 3/2/26								
409	Weather Delays	5 days	Mon 2/16/26	Fri 2/20/26								
410	AREA 3 & 5 - Pour slab on deck and remaining areas level 2 and level 3	10.9 days	Tue 2/17/26	Tue 4/7/26								
411	AREA 1-5 - Pour slab on deck level 3	9 days	Tue 2/17/26	Fri 2/27/26								
412	Area 4 & 6 remaining SOD pour	5 days	Tue 4/21/26	Mon 4/27/26								
413	Weather Delays	10 days	Mon 3/2/26	Fri 3/13/26								
414	AREA 1-5 - Pour slab on deck roof	5 days	Mon 3/16/26	Fri 3/20/26								
415	Install Fireproofing Exterior North and East Elevations	8 days	Tue 4/7/26	Thu 4/16/26								
416	Install Fireproofing Stairs & Elevator Shafts, and Duct Shafts	15 days	Fri 4/17/26	Thu 5/7/26								
417	Install Fireproofing Exterior South and West Elevations	0 days	Wed 4/15/26	Thu 4/23/26								
418	COL 2 - Install structural studs north elevation	16 days	Tue 3/10/26	Tue 3/31/26								
419	COL A - Install structural studs east elevation	14 days	Thu 3/12/26	Tue 3/31/26								
420	COL 12-14 - Install structural studs south elevation	15 days	Fri 4/3/26	Thu 4/23/26								
421	COL Q & 1 - Install structural studs west elevation	44 days	Thu 4/16/26	Wed 6/24/26								
422	Install sheathing north elevation	25 days	Mon 4/20/26	Fri 5/22/26								
423	Install sheathing east elevation	4 days	Mon 4/20/26	Thu 5/28/26								
424	Install sheathing south elevation	7 days	Tue 4/21/26	Tue 5/19/26								
425	Install sheathing west elevation	32 days	Tue 5/5/26	Thu 7/2/26								
426	Install roof blocking for curbs at Addition	5 days	Mon 5/11/26	Fri 5/15/26								
427	Install roof curbs at Addition	5 days	Thu 6/4/26	Wed 6/10/26								
428	Install Roof at Addition	12 days	Wed 5/27/26	Fri 7/24/26								
429	COL 2 - Install AMB and Stone Veneer North Elevation	5 days	Tue 6/16/26	Mon 6/22/26								
430	COL A - Install AMB and Stone Veneer East Elevation	30 days	Tue 6/23/26	Mon 8/3/26								

Customs House - Renovation and Add
Date: 14 JULY 2026

Task
Split

Milestone
Summary

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Manual Summary

Start-only

Finish-only

Progress

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CUSTOMS HOUSE - RENOVATION AND ADDITION

MASTER SCHEDULE

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431	COL 12-14 - Install AMB and Stone Veneer South Elevation	15 days	Tue 8/4/26	Mon 8/24/26								
432	COL Q & 1 - Install AMB and Stone Veneer West Elevation	10 days	Thu 7/2/26	Mon 9/7/26								
433	COL 2 - Install Windows North Elevation	5 days	Tue 6/23/26	Mon 6/29/26								
434	COL A - Install Windows East Elevation	10 days	Tue 8/4/26	Mon 8/17/26								
435	COL 12-14 - Install Windows South Elevation	5 days	Tue 8/25/26	Mon 8/31/26								
436	COL Q & 1 - Install Windows and Curtain Wall West Elevation	13 days	Tue 9/8/26	Thu 9/24/26								
437	Construct Mockup	60 days	Tue 4/14/26	Mon 7/6/26								
438	Field Verify Metal Panels	2 days	Tue 7/7/26	Wed 7/8/26								
439	Fabricate Wall Panels	30 days	Thu 7/9/26	Wed 8/19/26								
440	Install Metal Panels North Elevation	10 days	Thu 8/20/26	Wed 9/2/26								
441	Install Metal Panels East Elevation	10 days	Thu 8/20/26	Wed 9/2/26								
442	Install Metal Panels South Elevation	10 days	Tue 8/25/26	Mon 9/7/26								
443	Install Metal Panels West Elevation	10 days	Tue 9/8/26	Mon 9/21/26								
444	ADDITIONS - INTERIOR FRAMING AND MEP ROUGHINS	161 days	Thu 2/26/26	Thu 10/8/26								ADDITIONS - INT
445	Construct Hoistway B/C	44 days	Fri 5/8/26	Wed 7/8/26								
446	Construct Stairway B	28 days	Tue 4/21/26	Fri 6/26/26								
447	Construct Stairway A	7 days	Mon 6/1/26	Tue 7/7/26								
448	Construct Hoistway A	7 days	Mon 5/18/26	Thu 7/16/26								
449	Confirm Lead Levels	22 days	Thu 2/26/26	Fri 3/27/26								
450	Replace Stucco	20 days	Wed 4/8/26	Tue 5/5/26								
451	Interior Framing and MEP Level 3	139 days	Mon 3/30/26	Thu 10/8/26								
452	Install MEP Hangers	20 days	Mon 3/30/26	Fri 4/24/26								
453	Install Top Track for Metal Stud Framing	5 days	Mon 4/27/26	Fri 5/1/26								
454	Install Spray Fireproofing	15 days	Mon 7/27/26	Fri 8/14/26								
455	MEP Above Ceiling Rough-Ins	20 days	Mon 8/17/26	Fri 9/11/26								
456	Install Door Frames at Metal Stud Framing	3 days	Mon 8/17/26	Wed 8/19/26								
457	Install Metal Stud Framing	15 days	Thu 8/20/26	Wed 9/9/26								
458	Top Out Walls with Drywall	5 days	Thu 9/10/26	Wed 9/16/26								
459	MEP In-Wall Rough-In	20 days	Thu 9/3/26	Wed 9/30/26								
460	Install In-wall Blocking	2 days	Thu 9/10/26	Fri 9/11/26								
461	Drywall One Side	5 days	Thu 9/24/26	Wed 9/30/26								
462	In-Wall Inspections	1 day	Thu 10/1/26	Thu 10/1/26								
463	Insulate and Drywall Second Side	5 days	Fri 10/2/26	Thu 10/8/26								
464	Interior Framing and MEP Level 2	101 days	Mon 3/23/26	Mon 8/10/26								
465	MEP Above Ceiling Rough-Ins	20 days	Mon 3/23/26	Fri 4/24/26								
466	Install Spray Fireproofing	0 days	Mon 4/13/26	Thu 4/23/26								
467	Install Door Frames at Metal Stud Framing	3 days	Fri 5/29/26	Tue 6/2/26								
468	Install Metal Stud Framing	15 days	Tue 5/26/26	Mon 6/15/26								

Customs House - Renovation and Add
Date: 14 JULY 2026

Task
Split

Milestone
Summary

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Manual Summary

Start-only
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Progress
Deadline

Start-only
Finish-only

Progress
Deadline

Progress
Deadline

CUSTOMS HOUSE - RENOVATION AND ADDITION

MASTER SCHEDULE

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469	Top Out Walls with Drywall	5 days	Tue 6/2/26	Mon 6/22/26								
470	MEP In-Wall Rough-In	20 days	Tue 6/9/26	Mon 7/6/26								
471	Install In-wall Blocking	2 days	Tue 6/2/26	Wed 6/17/26								
472	Drywall One Side	5 days	Mon 7/27/26	Fri 7/31/26								
473	In-Wall Inspections	1 day	Mon 8/3/26	Mon 8/3/26								
474	Insulate and Drywall Second Side	5 days	Tue 8/4/26	Mon 8/10/26								
475	Interior Framing and MEP Level 1	106 days	Mon 3/16/26	Mon 8/10/26								
476	MEP Above Ceiling Rough-Ins	10 days	Mon 3/16/26	Fri 3/27/26								
477	Install Spray Fireproofing at Garage	7 days	Wed 4/29/26	Thu 5/7/26								
478	Install Spray Fireproofing at Office Space	0 days	Sat 4/25/26	Wed 4/29/26								
479	Install CMU Walls	10 days	Fri 5/22/26	Thu 6/4/26								
480	Construct Switchgear Room	20 days	Fri 5/22/26	Thu 7/2/26								
481	Construct Mechanical/Electrical Room	20 days	Fri 5/22/26	Thu 7/2/26								
482	Install Door Frames at Metal Stud Framing	3 days	Tue 5/26/26	Thu 5/28/26								
483	Install Metal Stud Framing	7 days	Mon 5/11/26	Mon 6/8/26								
484	Top Out Walls with Drywall	3 days	Wed 5/27/26	Thu 6/11/26								
485	MEP In-Wall Rough-In	10 days	Tue 5/26/26	Mon 6/22/26								
486	Install In-Wall Blocking	2 days	Wed 6/3/26	Wed 6/10/26								
487	Drywall One Side	5 days	Mon 7/27/26	Fri 7/31/26								
488	In-Wall Inspections	1 day	Mon 8/3/26	Mon 8/3/26								
489	Insulate and Drywall Second Side	5 days	Tue 8/4/26	Mon 8/10/26								
490	Install Elevators	45 days	Mon 10/12/26	Fri 12/11/26								
491	ADDITIONS - INTERIOR FINISHES	78 days	Tue 8/11/26	Thu 11/26/26								
492	Interior Finishes Level 3	35 days	Fri 10/9/26	Thu 11/26/26								
493	Interior Finishes Level 2	35 days	Tue 8/11/26	Mon 9/28/26								
494	Interior Finishes Level 1	20 days	Tue 8/11/26	Mon 9/7/26								
495	RENOVATIONS OF EXISTING CUSTOM HOUSE	1216 days	Tue 3/1/26	Wed 10/28/26								
496	Attic structural renovations	130 days	Mon 2/16/26	Fri 8/14/26								
497	Complete Demolition	3 days	Mon 2/16/26	Wed 2/18/26								
498	Repair Attic Floor Joists	30 days	Fri 2/27/26	Thu 4/9/26								
499	Layout GRDs in Floor	2 days	Fri 4/10/26	Mon 4/13/26								
500	RFI #107 - Attic Floor Duct Penetration	39 days	Wed 4/8/26	Fri 6/5/26								
501	Frame GRD openings in Attic Floor	10 days	Mon 6/8/26	Fri 6/19/26								
502	Install Cement Board	5 days	Mon 6/29/26	Fri 7/3/26								
503	Repair Wood Roof Framing	5 days	Mon 7/6/26	Fri 7/10/26								
504	Install Temporary Roof Opening	2 days	Mon 7/13/26	Tue 7/14/26								
505	Repair existing chimneys	20 days	Mon 6/1/26	Fri 6/26/26								
506	Install new Roof Steel	15 days	Wed 7/15/26	Tue 8/4/26								

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ID	Task Name	Duration	Start	Finish	June 2025	July 2025	August 2025	September 2025	October 2025	November 2025	December 2025	January 2026
					9 14 19 24 29	4 9 14 19 24 29	3 8 13 18 23 28	2 7 12 17 22 27	2 7 12 17 22 27	1 6 11 16 21 26	1 6 11 16 21 26	31 5 10 15 20 25 30
507	Install Drywall under Roof	5 days	Wed 8/5/26	Tue 8/11/26								
508	Install Metal Stud Walls	3 days	Wed 8/12/26	Fri 8/14/26								
509	Deliver and Stage AHU-3 and AHU-4	3 days	Wed 8/12/26	Fri 8/14/26								
510	Replace existing roof	10 days	Wed 8/12/26	Tue 8/25/26								
511	Strip and Re-paint Window Surrounds	20 days	Mon 5/18/26	Fri 6/12/26								
512	Replace Windows	20 days	Wed 5/6/26	Tue 6/2/26								
513	Renovate Mezzanine level	20 days	Mon 8/17/26	Fri 9/11/26								
514	Construct Elevator Control Room	20 days	Mon 9/14/26	Fri 10/9/26								
515	Renovate level 3 Courtroom and Offices	128 days	Mon 5/4/26	Wed 10/28/26								
516	Structural Repairs Above Doors	10 days	Mon 5/4/26	Fri 5/15/26								
517	Strip Woodwork and Strip Walls	15 days	Mon 5/18/26	Fri 6/5/26								
518	Remove and Replace Door Jambs	6 days	Mon 6/8/26	Mon 6/15/26								
519	Install Fire Rated Plywood under Floor	5 days	Tue 6/16/26	Mon 6/22/26								
520	Install Temporary Scaffolding	5 days	Tue 6/23/26	Mon 6/29/26								
521	Install MEP in Ceiling	10 days	Tue 6/30/26	Mon 7/13/26								
522	Install Metal Stud Drywall Coffered Ceilings	10 days	Tue 7/14/26	Mon 7/27/26								
523	Install Acoustabuilt Ceiling	5 days	Tue 7/28/26	Mon 8/3/26								
524	Remove Scaffolding	2 days	Tue 8/4/26	Wed 8/5/26								
525	Install New / Refurbished Windows	5 days	Thu 8/6/26	Wed 8/12/26								
526	Patch and Repair Existing Walls	20 days	Thu 8/13/26	Wed 9/9/26								
527	Install Acoustical Plaster Walls	10 days	Thu 9/10/26	Wed 9/23/26								
528	Build Elevated Platform	3 days	Thu 9/24/26	Mon 9/28/26								
529	MEP Rough-ins below Platform	3 days	Tue 9/29/26	Thu 10/1/26								
530	Prime and 1st Coat Painting	3 days	Thu 9/24/26	Mon /28/26								
531	Touch-ups	1 day	Tue 9/29/26	Tue 9/29/26								
532	Install Wood Floor	5 days	Wed 9/30/26	Tue 10/6/26								
533	Install new Doors and Hardware	2 days	Wed 10/7/26	Thu 10/8/26								
534	Install Wood Panel Wainscoat	1 day	Wed 10/7/26	Wed 10/7/26								
535	Final Painting and Touch-ups	3 days	Thu 10/8/26	Mon 10/12/26								
536	Install Millwork and Benches	7 days	Tue 10/13/26	Wed 10/21/26								
537	Install Electrical and Special Systems and Benches	5 days	Thu 10/22/26	Wed 10/28/26								
538	Renovate level 2	92 days	Mon 5/11/26	Tue 9/15/26								
539	MEP Above Ceiling Rough-Ins	10 days	Mon 8/17/26	Fri 8/28/26								
540	Install Spray Fireproofing	0 days	Mon 5/11/26	Fri 5/15/26								
541	Install Intumescent Paint	7 days	Wed 5/27/26	Thu 6/4/26								
542	Install Door Frames at Metal Stud Framing	1 day	Fri 6/5/26	Fri 6/5/26								
543	Install Metal Stud Framing	5 days	Mon 6/8/26	Fri 6/12/26								
544	Install Wooden Storefronts	4 days	Mon 6/8/26	Thu 6/11/26								

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ID	Task Name	Duration	Start	Finish	June 2025	July 2025	August 2025	September 2025	October 2025	November 2025	December 2025	January 2026
					9 14 19 24 29	4 9 14 19 24 29	3 8 13 18 23 28	2 7 12 17 22 27	2 7 12 17 22 27	1 6 11 16 21 26	1 6 11 16 21 26	31 5 10 15 20 25 30
545	Top Out Walls with Drywall	3 days	Fri 6/12/26	Tue 6/16/26								
546	MEP In-Wall Rough-In	10 days	Mon 6/8/26	Fri 6/19/26								
547	Install In-wall Blocking	1 day	Mon 6/15/26	Mon 6/15/26								
548	Drywall One Side	3 days	Mon 7/27/26	Wed 7/29/26								
549	In-Wall Inspections	1 day	Thu 7/30/26	Thu 7/30/26								
550	Insulate and Drywall Second Side	3 days	Fri 7/31/26	Tue 8/4/26								
551	Install Ceiling Grid	2 days	Wed 8/5/26	Thu 8/6/26								
552	Install Metal Stud Drywall Coffered Ceiling	5 days	Wed 8/5/26	Tue 8/11/26								
553	Install GRDs, Lights, and Devices	5 days	Fri 8/7/26	Thu 8/13/26								
554	Hang and Finish Drywall Ceilings	10 days	Wed 8/12/26	Tue 8/25/26								
555	Prime Paint and 1st Coat Walls and Ceilings	5 days	Wed 8/26/26	Tue 9/1/26								
556	Install Flooring	3 days	Wed 9/2/26	Fri 9/4/26								
557	Final Painting	5 days	Mon 9/7/26	Fri 9/11/26								
558	Install Doors and Hardware	2 days	Mon 9/14/26	Tue 9/15/26								
559	Renovate level 1	1187 days	Tue 3/1/22	Thu 9/17/26								Renovate level 1
560	Install Intumescent Paint	19 days	Mon 5/11/26	Thu 6/4/26								
561	Rough-in MEP	10 days	Fri 8/21/26	Thu 9/3/26								
562	Construct Metal Stud Chase Walls	2 days	Fri 9/4/26	Mon 9/7/26								
563	Construct Fire Pump Room	15 days	Tue 3/1/22	Mon 3/21/22								
564	Construct Mechanical Room	5 days	Tue 3/1/22	Mon 3/7/22								
565	Install Ceiling Grid	2 days	Fri 9/4/26	Mon 9/7/26								
566	Install Drywall Ceiling	2 days	Tue 9/8/26	Wed 9/9/26								
567	Install Lights and Devices	3 days	Thu 9/10/26	Mon 9/14/26								
568	Prime Paint and 1st Coat	2 days	Tue 3/1/22	Wed 3/2/22								
569	Install Casework	1 day	Tue 9/8/26	Tue 9/8/26								
570	Install Flooring	2 days	Wed 9/9/26	Thu 9/10/26								
571	Install Plumbing Fixtures	1 day	Fri 9/11/26	Fri 9/11/26								
572	Final Painting	2 days	Mon 9/14/26	Tue 9/15/26								
573	Install Doors and Hardware	2 days	Wed 9/16/26	Thu 9/17/26								
574	FINISH SITEWORK & LANDSCAPING	152 days	Thu 5/21/26	Fri 12/18/26								
575	Remove Scaffold and Steps West Elevation	2 days	Tue 6/30/26	Wed 7/1/26								
576	Traffic Signal Delay	47 days	Thu 5/21/26	Fri 7/24/26								
577	West Elevation Excavation, Shoring and Foundation Waterproofing	15 days	Mon 7/27/26	Fri 8/14/26								
578	Remove existing storm and install water main and pit	10 days	Mon 8/17/26	Fri 8/28/26								
579	Install Storm Drains MH-8 to MH-7	4 days	Mon 8/31/26	Thu 9/3/26								
580	Install Primary Ductbank North and West Elevation	3 days	Fri 9/4/26	Tue 9/8/26								
581	Concrete retaining wall and trench drains	15 days	Wed 9/9/26	Tue 9/29/26								
582	Install DP&L Gas Line	3 days	Wed 9/30/26	Fri 10/2/26								

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					9 14 19 24 29 4	9 14 19 24 29 3	8 13 18 23 28 2	7 12 17 22 27 2	7 12 17 22 27 1	6 11 16 21 26 1	6 11 16 21 26 31 5	10 15 20 25 30
583	Install SWM #1 Storm Tank	15 days	Fri 9/25/26	Thu 10/15/26								
584	Re-setting of steps in front of Customs House	5 days	Fri 10/16/26	Thu 10/22/26								
585	Front Plaza Steps Concrete	10 days	Fri 10/23/26	Thu 11/5/26								
586	Install bollards, curbs, sidewalks, and pavers	20 days	Fri 11/6/26	Thu 12/3/26								
587	Landscaping	3 days	Fri 12/4/26	Tue 12/8/26								
588	Paving	8 days	Wed 12/9/26	Fri 12/18/26								
589	PUNCHLIST SITEWORK	10 days	Mon 12/21/26	Fri 1/11/27								
590	COMMISSIONING & PUNCHLIST NEW ADDITION	20 days	Fri 11/27/26	Thu 12/24/26								
591	COMMISSIONING & PUNCHLIST RENOVATION	10 days	Thu 10/22/26	Wed 11/4/26								
592	DELIVERY AND SETUP OF FF&E	15 days	Tue 12/15/26	Mon 1/4/27								
593	INSTALL AND SETUP A/V AND IT SYSTEMS	15 days	Tue 1/5/27	Mon 1/25/27								
594	OWNER TURNOVER AND FINAL CLEANING	0 days	Mon 1/25/27	Mon 1/25/27								
595	OWNER MOVE-IN	10 days	Tue 1/26/27	Mon 2/8/27								

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SECTION 013226

CONTRACTOR DAILY REPORTS

1. CONTRACTOR DAILY REPORTS

- A. The Contractor shall submit a Daily Report to the Construction Manager on the forms provided covering the following subjects:
 - 1. Work in Progress, including areas where work is being performed, nature of the operations in progress, and the manpower assigned.
 - 2. Extra Work (Time and Material) in progress.
 - 3. Materials Received.
 - 4. Trade labor breakdown including identification of all workers on site and the number of hours (or portions thereof) worked by each.
 - 5. Inspection Checklist (performed daily).
- B. The Contractor shall submit the Daily Report to the Construction Manager by 9:00 AM on the next workday following the workday covered in the Daily Report.

2. DAILY EXTRA WORK REPORT

- A. The Contractor shall submit on the form provided a Daily Extra Work Report on each day he performs authorized Extra Work on a time and material basis.
- B. A separate Daily Extra Work Report shall be submitted for each separate authorized Extra Work item done on a time and material basis.
- C. The Contractor shall submit his Daily Extra Work Report as an attachment to his Daily Report by 9:00 AM on the next workday following the workday covered in the Daily Extra Work Report.

3. SAMPLE DAILY REPORT

- A. A sample daily report follows this section for your reference.

END OF SECTION

CONTRACTOR'S DAILY REPORT

(Print)

TRADE	*CLASS	MANPOWER COUNT	TOTAL MAN HOURS	TODAY'S DESCRIPTION / LOCATION OF WORK
	TOTAL			

* INDICATE: F = FOREMAN; J = JOURNEYMAN; A = APPRENTICE

The use of any machinery, tool, material, or equipment which is not in compliance with any applicable requirement

Below is a general checklist of requirements on this project. Contractors will check off items that pertain to their contract and project tasks. Notify EDiS Field Manager of any issues. This checklist is not meant to be all inclusive. Please refer to additional OSHA regulations for compliance.

House Keeping

- ☐ Material Storage Area's Orderly
- ☐ Trash Containers Available and Emptied daily
- ☐ Fire Hazards
- ☐ Lighting and ventilation
- ☐ Exits and Stair clear passage
- ☐ Walkways, corridors clear passage
- ☐ Daily debris /trash removal
- ☐ _____

Personal Protective Equipment

- ☐ Hard Hats being worn
- ☐ Safety Glasses with side shields being worn
- ☐ Secondary Eye/Face protection
- ☐ Respirators as required
- ☐ Hand protection when needed
- ☐ Ear protection when needed
- ☐ Inspected & Maintained
- ☐ _____

Fire Prevention

- ☐ Fire extinguishers inspected
- ☐ Flammable / Combustibles properly store
- ☐ Approved Fuel cans used and labeled
- ☐ Oxygen / Acetylenes stored properly
- ☐ _____

Electrical

- ☐ GFI in use
- ☐ Three prong insulated extension cords used
- ☐ Extension cords in good condition
- ☐ Lockout / Tag-out program in use
- ☐ _____

Excavations

- ☐ Miss Utility been contacted
- ☐ Properly Barricaded
- ☐ Ladders in use at depths over 4'-0"
- ☐ Ladders every 25'-0" distance
- ☐ Shored, sloped, benched as required
- ☐ Dewatering as needed
- ☐ _____

Ladders

- ☐ Good condition
- ☐ Correct pitch
- ☐ Extends 3'-0" above landing
- ☐ Open and secured / tied off
- ☐ _____

Scaffolds

- ☐ Certified Scaffold Installer
- ☐ Guardrails, toe boards, and planking secured
- ☐ Appropriate signage
- ☐ Adequate cross bracing
- ☐ Secured to building over 25'-0" in height
- ☐ _____

Cranes

- ☐ Rated Load Capacity available in cab
- ☐ Swing Radius barricaded
- ☐ Appropriate certificates / decals / hand signals
- ☐ Daily safety inspection log completed
- ☐ _____

Fall Protection

- ☐ Fall protection plan on file
- ☐ Full harness / shock absorbing lanyard used
- ☐ Anchoring points secured
- ☐ Perimeter barricades
- ☐ Open sided floor protection
- ☐ 6'-0" Tie-off utilized
- ☐ _____

Paperwork

- ☐ MSDS Information
- ☐ Contractors Safety Program
- ☐ Hazardous Communications Training
- ☐ Hazardous Communications Program
- ☐ Contractor Qualified Representation
- ☐ _____

Other

- ☐ _____
- ☐ _____

Foreman / Competent Person:

Print Name _____

SECTION 01 32 33

PHOTOGRAPHIC DOCUMENTATION

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Preconstruction photographs.
2. Periodic construction photographs.
3. Final completion construction photographs.

B. Photographic Documentation included within this section is to be the responsibility of the Construction Manager.

1.2 UNIT PRICES

A. Basis for Bids: Base number of construction photographs on average of 20 photographs per week over the duration of Project.

1.3 INFORMATIONAL SUBMITTALS

A. Key Plan: Submit key plan of Project site and building with notation of vantage points marked for location and direction of each photograph. Indicate elevation or story of construction. Include same information as corresponding photographic documentation.

B. Digital Photographs: Submit image files within three days of taking photographs.

1. Digital Camera: Minimum sensor resolution of 8 megapixels.
2. Format: Minimum 3200 by 2400 pixels, in unaltered original files, with same aspect ratio as the sensor, uncropped, date and time stamped, in folder named by date of photograph, accompanied by key plan file.
3. Identification: Provide the following information with each image description in file metadata tag:
 - a. Name of Project.
 - b. Name and contact information for photographer.
 - c. Name of Architect.
 - d. Name of Contractor.
 - e. Date photograph was taken.
 - f. Description of vantage point, indicating location, direction (by compass point), and elevation or story of construction.
 - g. Unique sequential identifier keyed to accompanying key plan.

1.4 QUALITY ASSURANCE

- A. Photographer Qualifications: An individual who has been regularly engaged as a professional photographer of construction projects for not less than three years.

1.5 USAGE RIGHTS

- A. Obtain and transfer copyright usage rights from photographer to Owner for unlimited reproduction of photographic documentation.

PART 2 - PRODUCTS

2.1 PHOTOGRAPHIC MEDIA

- A. Digital Images: Provide images in JPG format, produced by a digital camera with minimum sensor size of 8 megapixels, and at an image resolution of not less than 3200 by 2400 pixels.

PART 3 - EXECUTION

3.1 CONSTRUCTION PHOTOGRAPHS

- A. Photographer: Engage a qualified photographer to take construction photographs.
- B. General: Take photographs using the maximum range of depth of field, and that are in focus, to clearly show the Work. Photographs with blurry or out-of-focus areas will not be accepted.
 - 1. Maintain key plan with each set of construction photographs that identifies each photographic location
- C. Digital Images: Submit digital images exactly as originally recorded in the digital camera, without alteration, manipulation, editing, or modifications using image-editing software.
 - 1. Date and Time: Include date and time in file name for each image.
 - 2. Field Office Images: Maintain one set of images accessible in the field office at Project site, available at all times for reference. Identify images in the same manner as those submitted to Architect.
- D. Preconstruction Photographs: Before commencement of work, take photographs of Project site, building perimeter, hardscape, paving, building elevations, and interior photographs of floor, ceiling, and each wall or each interior room/space, including existing items to remain during construction, from different vantage points, as directed by Architect.
 - 1. Flag excavation areas before taking construction photographs.
 - 2. Take 20 photographs to show existing conditions adjacent to property before starting the Work.

3. Take additional photographs as required to record settlement or cracking of adjacent structures, pavements, and improvements.
- E. Periodic Construction Photographs: Take 20 photographs weekly, with timing each month adjusted to coincide with the cutoff date associated with each Application for Payment. Select vantage points to show status of construction and progress since last photographs were taken.
- F. Architect-Directed Construction Photographs: From time to time, Architect will instruct photographer about number and frequency of photographs and general directions on vantage points. Select actual vantage points and take photographs to show the status of construction and progress since last photographs were taken.
- G. Time-Lapse Sequence Construction Photographs: Take 20 photographs as indicated, to show status of construction and progress since last photographs were taken.
 1. Frequency: Take photographs monthly, coinciding with the cutoff date associated with each Application for Payment.
- H. Final Completion Construction Photographs: Take 20 color photographs after date of Substantial Completion for submission as project record documents. Architect will inform photographer of desired vantage points.
 1. Do not include date stamp.
- I. Additional Photographs: Architect may request photographs in addition to periodic photographs specified. Additional photographs will be paid for by Change Order and are not included in the Contract Sum.
 1. Three days' notice will be given, where feasible.
 2. In emergency situations, take additional photographs within 24 hours of request.
 3. Circumstances that could require additional photographs include, but are not limited to, the following:
 - a. Special events planned at Project site.
 - b. Immediate follow-up when on-site events result in construction damage or losses.
 - c. Photographs to be taken at fabrication locations away from Project site. These photographs are not subject to unit prices or unit-cost allowances.
 - d. Substantial Completion of a major phase or component of the Work.
 - e. Extra record photographs at time of final acceptance.
 - f. Owner's request for special publicity photographs.

END OF SECTION

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SECTION 01 33 00
SUBMITTAL PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Shop Drawings.
2. Product Data.
3. Samples.
4. Other submittals.

1.2 DEFINITIONS

- A. Action Submittals:** Written and graphic information and physical samples that require Architect's responsive action. Action submittals are those submittals indicated in individual Specification Sections as "action submittals."
- B. Informational Submittals:** Written and graphic information and physical samples that do not require Architect's responsive action. Submittals may be rejected for not complying with requirements. Informational submittals are those submittals indicated in individual Specification Sections as "informational submittals."
- C. Portable Document Format (PDF):** An open standard file format licensed by Adobe Systems used for representing documents in a device-independent and display resolution-independent fixed-layout document format.

1.3 ACTION SUBMITTALS

- A. Submittal Schedule:** Submit a schedule of submittals, arranged in chronological order by dates required by construction schedule. Include time required for review, ordering, manufacturing, fabrication, and delivery when establishing dates. Include additional time required for making corrections or revisions to submittals noted by Architect and additional time for handling and reviewing submittals required by those corrections.
1. Coordinate submittal schedule with list of subcontracts, the schedule of values, and Contractor's construction schedule.
 2. Initial Submittal: Submit concurrently with startup construction schedule. Include submittals required during the first 60 days of construction. List those submittals required to maintain orderly progress of the Work and those required early because of long lead time for manufacture or fabrication.
 3. Final Submittal: Submit concurrently with the first complete submittal of Contractor's construction schedule.

- a. Submit revised submittal schedule to reflect changes in current status and timing for submittals.
4. Format: Arrange the following information in a tabular format:
 - a. Scheduled date for first submittal.
 - b. Specification Section number and title.
 - c. Submittal category: Action; informational.
 - d. Name of subcontractor.
 - e. Description of the Work covered.
 - f. Scheduled date for Architect's final release or approval.
 - g. Scheduled date of fabrication.
 - h. Scheduled dates for purchasing.
 - i. Scheduled dates for installation.
 - j. Activity or event number.

1.4 SUBMITTAL ADMINISTRATIVE REQUIREMENTS

- A. Architect's Digital Data Files: Electronic digital data files of the Contract Drawings will be provided by Architect for Contractor's use in preparing submittals.
 1. Architect will furnish Contractor one set of digital data drawing files of the Contract Drawings for use in preparing Shop Drawings.
 - a. Architect makes no representations as to the accuracy or completeness of digital data drawing files as they relate to the Contract Drawings.
 - b. Digital Drawing Software Program: The Contract Drawings are available in AutoCAD 2013 format.
 - c. Contractor shall execute a data licensing agreement in the form of Agreement form acceptable to Owner and Architect.
- B. Coordination: Coordinate preparation and processing of submittals with performance of construction activities. Contractor or CM shall use Architect's cover sheet for all submittal correspondences. Architect reserves the right to withhold action on any submittal where said cover sheet is omitted.
 1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.
 2. Submit all submittal items required for each Specification Section concurrently unless partial submittals for portions of the Work are indicated on approved submittal schedule.
 3. Submit action submittals and informational submittals required by the same Specification Section as separate packages under separate transmittals.
 4. Coordinate transmittal of different types of submittals for related parts of the Work so processing will not be delayed because of need to review submittals concurrently for coordination.
 - a. Architect reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.

- C. Processing Time: Allow time for submittal review, including time for resubmittals. Time for review shall commence on Architect's receipt of submittal. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing, including resubmittals.
1. Initial Review: Allow 15 days for initial review of each submittal. Allow additional time if coordination with subsequent submittals is required. Architect will advise Contractor when a submittal being processed must be delayed for coordination.
 2. Intermediate Review: If intermediate submittal is necessary, process it in same manner as initial submittal.
 3. Resubmittal Review: Allow 15 days for review of each resubmittal.
 4. Sequential Review: Where sequential review of submittals by Architect's consultants, Owner, or other parties is indicated, allow 15 days for initial review of each submittal.
 5. Concurrent Consultant Review: Where the Contract Documents indicate that submittals may be transmitted simultaneously to Architect and to Architect's consultants, allow 15 days for review of each submittal. Submittal will be returned to Architect before being returned to Contractor.
- D. Electronic Submittals: Identify and incorporate information in each electronic submittal file as follows:
1. Assemble complete submittal package into a single indexed file incorporating submittal requirements of a single Specification Section and transmittal form with links enabling navigation to each item.
 2. Name file with submittal number or other unique identifier, including revision identifier.
 - a. File name shall use project identifier and Specification Section number followed by a dash, then a sequential number, then Section Name, and then a submittal type (PD=Product Data, SD=Shop Drawing, or SA=Sample) (e.g., 05 50 00-01-Misc. Metals-PD, SD, or SA). Resubmittals shall include an alphabetic suffix after another dash (e.g., 05 50 00-01-Misc. Metals-PD, SD, or SA-A).
 3. Provide means for insertion to permanently record Contractor's review and approval markings and action taken by Architect.
 4. Transmittal Form for Electronic Submittals: Use software-generated form from electronic project management software acceptable to Owner, containing the following information:
 - a. Project name.
 - b. Date.
 - c. Name and address of Architect.
 - d. Name of Contractor.
 - e. Name of firm or entity that prepared submittal.
 - f. Names of subcontractor, manufacturer, and supplier.
 - g. Category and type of submittal.
 - h. Submittal purpose and description.
 - i. Specification Section number and title.
 - j. Specification paragraph number or drawing designation and generic name for each of multiple items.
 - k. Drawing number and detail references, as appropriate.
 - l. Location(s) where product is to be installed, as appropriate.
 - m. Related physical samples submitted directly.

- n. Indication of full or partial submittal.
 - o. Transmittal number.
 - p. Submittal and transmittal distribution record.
 - q. Other necessary identification.
 - r. Remarks.
- E. Options: Identify options requiring selection by Architect.
- F. Deviations and Additional Information: On an attached separate sheet, prepared on Contractor's letterhead, record relevant information, requests for data, revisions other than those requested by Architect on previous submittals, and deviations from requirements in the Contract Documents, including minor variations and limitations. Include same identification information as related submittal.
- G. Resubmittals: Make resubmittals in same form and number of copies as initial submittal.
 - 1. Note date and content of previous submittal.
 - 2. Note date and content of revision in label or title block and clearly indicate extent of revision.
 - 3. Resubmit submittals until they are marked with approval notation from Architect's action stamp.
- H. Distribution: Furnish copies of final submittals to manufacturers, subcontractors, suppliers, fabricators, installers, authorities having jurisdiction, and others as necessary for performance of construction activities. Show distribution on transmittal forms.
- I. Use for Construction: Retain complete copies of submittals on Project site. Use only final action submittals that are marked with approval notation from Architect's action stamp.

PART 2 - PRODUCTS

2.1 SUBMITTAL PROCEDURES

- A. General Submittal Procedure Requirements: Prepare and submit submittals required by individual Specification Sections. Types of submittals are indicated in individual Specification Sections.
 - 1. Post electronic submittals as PDF electronic files directly to Project Web site specifically established for Project.
 - a. Architect will return annotated file. Annotate and retain one copy of file as an electronic Project record document file.
 - 2. Certificates and Certifications Submittals: Provide a statement that includes signature of entity responsible for preparing certification. Certificates and certifications shall be signed by an officer or other individual authorized to sign documents on behalf of that entity.

- a. Provide a digital signature with digital certificate on electronically submitted certificates and certifications where indicated.
 - b. Provide a notarized statement on original paper copy certificates and certifications where indicated.
- B. Product Data: Collect information into a single submittal for each element of construction and type of product or equipment.
 1. If information must be specially prepared for submittal because standard published data are not suitable for use, submit as Shop Drawings, not as Product Data.
 2. Mark each copy of each submittal to show which products and options are applicable.
 3. Include the following information, as applicable:
 - a. Manufacturer's catalog cuts.
 - b. Manufacturer's product specifications.
 - c. Standard color charts.
 - d. Statement of compliance with specified referenced standards.
 - e. Testing by recognized testing agency.
 - f. Application of testing agency labels and seals.
 - g. Notation of coordination requirements.
 - h. Availability and delivery time information.
 4. For equipment, include the following in addition to the above, as applicable:
 - a. Wiring diagrams showing factory installed wiring.
 - b. Printed performance curves.
 - c. Operational range diagrams.
 - d. Clearances required to other construction, if not indicated on accompanying Shop Drawings.
 5. Submit Product Data before or concurrent with Samples.
 6. Submit Product Data in the following format:
 - a. PDF electronic file.
- C. Shop Drawings: Prepare Project-specific information, drawn accurately to scale. Do not base Shop Drawings on reproductions of the Contract Documents or standard printed data.
 1. Preparation: Fully illustrate requirements in the Contract Documents. Include the following information, as applicable:
 - a. Identification of products.
 - b. Schedules.
 - c. Compliance with specified standards.
 - d. Notation of coordination requirements.
 - e. Notation of dimensions established by field measurement.
 - f. Relationship and attachment to adjoining construction clearly indicated.
 - g. Seal and signature of professional engineer if specified.
 2. Sheet Size: Except for templates, patterns, and similar full-size drawings, submit Shop Drawings on sheets at least 8-1/2 by 11 inches, but no larger than 30 by 42 inches.

3. Submit Shop Drawings in the following format:
 - a. PDF electronic file.
- D. Samples: Submit Samples for review of kind, color, pattern, and texture for a check of these characteristics with other elements and for a comparison of these characteristics between submittal and actual component as delivered and installed. Take photos of physical samples and upload with cover sheet to Submittal Exchange for comments and record purposes. Either mail or hand deliver physical samples concurrently with Submittal Exchange submission.
 1. Transmit Samples that contain multiple, related components such as accessories together in one submittal package.
 2. Identification: Attach label on unexposed side of Samples that includes the following:
 - a. Generic description of Sample.
 - b. Product name and name of manufacturer.
 - c. Sample source.
 - d. Number and title of applicable Specification Section.
 - e. Specification paragraph number and generic name of each item.
 3. For projects where electronic submittals are required, provide corresponding electronic submittal of Sample transmittal, digital image file illustrating Sample characteristics, and identification information for record.
 4. Disposition: Maintain sets of approved Samples at Project site, available for quality-control comparisons throughout the course of construction activity. Sample sets may be used to determine final acceptance of construction associated with each set.
 - a. Samples that may be incorporated into the Work are indicated in individual Specification Sections. Such Samples must be in an undamaged condition at time of use.
 - b. Samples not incorporated into the Work, or otherwise designated as Owner's property, are the property of Contractor.
 5. Samples for Initial Selection: Submit manufacturer's color charts consisting of units or sections of units showing the full range of colors, textures, and patterns available.
 - a. Number of Samples: Submit one full set of available choices where color, pattern, texture, or similar characteristics are required to be selected from manufacturer's product line. Architect will return submittal with options selected.
 6. Samples for Verification: Submit full-size units or Samples of size indicated, prepared from same material to be used for the Work, cured and finished in manner specified, and physically identical with material or product proposed for use, and that show full range of color and texture variations expected. Samples include, but are not limited to, the following: partial sections of manufactured or fabricated components; small cuts or containers of materials; complete units of repetitively used materials; swatches showing color, texture, and pattern; color range sets; and components used for independent testing and inspection.
 - a. Number of Samples: Submit four sets of Samples. Architect will retain one Sample sets, one sample set will be sent to the Owner; remainder will be returned.

- 1) Submit a single Sample where assembly details, workmanship, fabrication techniques, connections, operation, and other similar characteristics are to be demonstrated.
 - 2) If variation in color, pattern, texture, or other characteristic is inherent in material or product represented by a Sample, submit at least three sets of paired units that show approximate limits of variations.
- E. Product Schedule: As required in individual Specification Sections, prepare a written summary indicating types of products required for the Work and their intended location. Include the following information in tabular form:
1. Type of product. Include unique identifier for each product indicated in the Contract Documents or assigned by Contractor if none is indicated.
 2. Manufacturer and product name, and model number if applicable.
 3. Number and name of room or space.
 4. Location within room or space.
 5. Submit product schedule in the following format:
 - a. PDF electronic file.
- F. Coordination Drawing Submittals: Comply with requirements specified in Section 01 31 00 "Project Management and Coordination."
- G. Application for Payment and Schedule of Values: Comply with requirements specified in Section 01 29 00 "Payment Procedures."
- H. Test and Inspection Reports and Schedule of Tests and Inspections Submittals: Comply with requirements specified in Section 01 40 00 "Quality Requirements."
- I. Closeout Submittals and Maintenance Material Submittals: Comply with requirements specified in Section 01 77 00 "Closeout Procedures."
- J. Maintenance Data: Comply with requirements specified in Section 01 78 23 "Operation and Maintenance Data."
- K. Qualification Data: Prepare written information that demonstrates capabilities and experience of firm or person. Include lists of completed projects with project names and addresses, contact information of architects and owners, and other information specified.
- L. Welding Certificates: Prepare written certification that welding procedures and personnel comply with requirements in the Contract Documents. Submit record of Welding Procedure Specification and Procedure Qualification Record on AWS forms. Include names of firms and personnel certified.
- M. Installer Certificates: Submit written statements on manufacturer's letterhead certifying that Installer complies with requirements in the Contract Documents and, where required, is authorized by manufacturer for this specific Project.
- N. Manufacturer Certificates: Submit written statements on manufacturer's letterhead certifying that manufacturer complies with requirements in the Contract Documents. Include evidence of manufacturing experience where required.

- O. Product Certificates: Submit written statements on manufacturer's letterhead certifying that product complies with requirements in the Contract Documents.
- P. Material Certificates: Submit written statements on manufacturer's letterhead certifying that material complies with requirements in the Contract Documents.
- Q. Material Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting test results of material for compliance with requirements in the Contract Documents.
- R. Product Test Reports: Submit written reports indicating that current product produced by manufacturer complies with requirements in the Contract Documents. Base reports on evaluation of tests performed by manufacturer and witnessed by a qualified testing agency, or on comprehensive tests performed by a qualified testing agency.
- S. Research Reports: Submit written evidence, from a model code organization acceptable to authorities having jurisdiction, that product complies with building code in effect for Project. Include the following information:
 - 1. Name of evaluation organization.
 - 2. Date of evaluation.
 - 3. Time period when report is in effect.
 - 4. Product and manufacturers' names.
 - 5. Description of product.
 - 6. Test procedures and results.
 - 7. Limitations of use.
- T. Preconstruction Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of tests performed before installation of product, for compliance with performance requirements in the Contract Documents.
- U. Compatibility Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of compatibility tests performed before installation of product. Include written recommendations for primers and substrate preparation needed for adhesion.
- V. Field Test Reports: Submit written reports indicating and interpreting results of field tests performed either during installation of product or after product is installed in its final location, for compliance with requirements in the Contract Documents.
- W. Design Data: Prepare and submit written and graphic information, including, but not limited to, performance and design criteria, list of applicable codes and regulations, and calculations. Include list of assumptions and other performance and design criteria and a summary of loads. Include load diagrams if applicable. Provide name and version of software, if any, used for calculations. Include page numbers.

2.2 DELEGATED-DESIGN SERVICES

- A. Performance and Design Criteria: Where professional design services or certifications by a design professional are specifically required of Contractor by the Contract Documents, provide products and systems complying with specific performance and design criteria indicated.
 - 1. If criteria indicated are not sufficient to perform services or certification required, submit a written request for additional information to Architect.
- B. Delegated-Design Services Certification: In addition to Shop Drawings, Product Data, and other required submittals, submit digitally signed PDF electronic file and three paper copies of certificate, signed and sealed by the responsible design professional, for each product and system specifically assigned to Contractor to be designed or certified by a design professional.
 - 1. Indicate that products and systems comply with performance and design criteria in the Contract Documents. Include list of codes, loads, and other factors used in performing these services.

PART 3 - EXECUTION

3.1 CONTRACTOR'S REVIEW

- A. Action and Informational Submittals: Review each submittal and check for coordination with other Work of the Contract and for compliance with the Contract Documents. Note corrections and field dimensions. Mark with approval stamp before submitting to Architect and Construction Manager.
- B. Project Closeout and Maintenance Material Submittals: See requirements in Section 01 77 00 "Closeout Procedures."
- C. Approval Stamp: Stamp each submittal with a uniform, approval stamp. Include Project name and location, submittal number, Specification Section title and number, name of reviewer, date of Contractor's approval, and statement certifying that submittal has been reviewed, checked, and approved for compliance with the Contract Documents.

3.2 ARCHITECT'S ACTION

- A. Action Submittals: Architect will review each submittal, make marks to indicate corrections or revisions required, and return it. Architect will stamp each submittal with an action stamp and will mark stamp appropriately to indicate action.
- B. Informational Submittals: Architect will review each submittal and will not return it, or will return it if it does not comply with requirements. Architect will forward each submittal to appropriate party.
- C. Partial submittals prepared for a portion of the Work will be reviewed when use of partial submittals has received prior approval from Architect.

- D. Incomplete submittals are unacceptable, will be considered nonresponsive, and will be returned for resubmittal without review.
- E. Submittals not required by the Contract Documents may be returned by the Architect without action.

END OF SECTION

NOT FOR BIDDING PURPOSES

SECTION 013523 - SAFETY PROGRAM

1. GENERAL

- A. The Contractor shall be responsible for initiating, maintaining, and supervising all safety activities and programs in connection with their Work.
- B. Contractor shall be responsible for the safety of their personnel as well as their subcontractors.
- C. Hard hats and safety glasses must be worn by all personnel on the job site, except in contractor's administrative office/trailer. All equipment must comply with OSHA standards. All job site personnel shall wear long pants, shirts (no tank tops), high visibility garments worn on the outer layer of clothing, and work boots.

2. SAFETY PROGRAM

- A. Prior to commencing the work, the Contractor shall submit to the Construction Manager (1) electronic copy and (1) bound copy of its safety program and one (1) copy of SDS information in a 2" ringed notebook. One paper copy of the safety program and SDS will be retained by the Construction Manager in the field office.
- B. The safety program shall outline those hazards peculiar to the Contractor's Work, and the steps to be taken to eliminate or reduce the risk of injury or loss due to those hazards. The program shall be project and site specific. Every Contractor shall implement and enforce its safety program, in accordance with all OSHA, Federal, State, and local laws.
- C. Crystalline Silica Exposure Control Plan - Affected Contractors must provide a Written Exposure Control Plan for Respirable Crystalline Silica, meeting Subpart Z of the OSHA Construction Industry Regulations, that ensures each employee covered by this section of the Regulations can demonstrate knowledge and understanding meeting the requirements of the regulation, identify the competent person designated by the employer in accordance with the section, and otherwise comply with the requirements of this section of the Regulations.
- D. Every Contractor shall designate a qualified Safety Supervisor and Alternate to implement the safety program. If during the progress of the work the Safety Supervisor is not performing their duties in a manner satisfactory to the Construction Manager the Contractor will designate a new qualified Safety Supervisor.
- E. Every Contractor shall furnish the names and qualifications of the Primary and Alternate competent persons and qualified persons who may be required for their scope of work by the Contractor's safety procedures, and by federal, state and/or local regulations. Examples include competent persons and/or qualified persons for steel erection, excavation, scaffold erection,

confined space entry, crane and rigging operations, annual crane inspections, fall protection including horizontal lifeline systems, etc.

- F. The employer shall verify compliance by preparing a written certification record. The written certification record shall contain the name or other identity of the employee trained, the date(s) of the training and the signature of the person who conducted the training or the signature of the employer. If the employer relies on training conducted by another employer or completed prior to the effective date of this section, the certification record shall include the date the employer determined the prior training was adequate rather than the date of actual training.
- G. Copies of any and all documents, including information stored electronically, such as safety and health program handbooks and training certification records shall be provided when necessary.
 - 1. The employer shall instruct each employee in the recognition and avoidance of unsafe conditions and the regulations applicable to his work environment to control or eliminate any hazards or other exposure to illness or injury. Please forward certification (document) of training for each employee on an EDiS project. The latest training certificate shall be maintained.
- H. Contractor Daily Reports with Safety Inspection Checklist will be submitted daily to the Superintendent, verifying inspection of work area, machinery, equipment, and tools.
- I. Prior to starting work on-site, the Contractor shall arrange with the on-site Superintendent to have their employees complete the EDiS Company Zero Accidents Safety Orientation program.
- J. Every Contractor shall hold, at a minimum, weekly safety toolbox talks with all its employees every Monday at 12:30 PM. Every Contractor shall designate a responsible, qualified, and capable person to conduct these meetings. Contractor's safety supervisor or superintendent must submit to the Construction Manager weekly toolbox talks attendance sheets and the topics discussed.

3. SUBSTANCE ABUSE POLICY STATEMENT

- A. The Construction Manager is committed to providing a safe work site environment for its employees and Contractors' employees. The Construction Manager does not condone or permit employees and Contractors' employees to use or be under the influence of drugs or alcohol while they are on any of the Construction Manager work sites. The Policy is as follows:
 - 1. It is a violation of the Construction Manager's policy for employees and Contractors' employees to use, possess, sell, trade, or otherwise engage in the use of illegal drugs and alcohol.
 - 2. It is a violation for employees and Contractors' employees to report to work while influenced by illegal drugs or alcohol.
 - 3. It is a violation for employees and Contractors' employees to use prescription drugs illegally

(i.e., to use prescription drugs that have not been legally obtained) and to use prescription drugs in a manner other than the prescribed intentions.

4. Employees and Contractors' employees who are taking medication, which is prescribed by their physician, are expected to discuss potential side effects with their prescribing physician, as it relates to the work requirements.

- B. Violations of this policy will require disciplinary action. If any employees or Contractors' employees are observed or suspected of being influenced by drugs or alcohol, they will be instructed to stop work and may be required to leave the work site.

4. EXECUTION

- A. Every Contractor shall comply with all applicable federal, state and local laws, regulations and orders relating to occupational safety and health, and related procedures, and shall, to the extent permitted by law, indemnify and hold Construction Manager, Owner and Architect, and their respective directors, officers, or agents and employees harmless from any and all liability, public or private, penalties, contractual or otherwise, losses, damages, costs, attorney's fees, expenses, causes of action, claims or judgments resulting from a claim filed by anyone in connection with the aforementioned acts, or any rule, regulation or order promulgated thereunder, arising out of the Contractor's Work, this Agreement or any subcontract executed in prosecution of the Work. Every Contractor further agrees in the event of a claim of violation of any such laws, regulations, orders, or procedures arising out of or in any way connected with the performance of this agreement, Construction Manager may immediately take whatever action is deemed necessary by Owner and/or Construction Manager to remedy the claim or violation. Any and all costs or expenses paid or incurred by Owner and/or Construction Manager in taking such action shall be borne by the Contractor and may be deducted from any payments due Contractor.
- B. The Contractor agrees to (1) take all necessary steps to promote safety and health on the job site; (2) cooperate with Owner and/or Construction Manager and other Contractors in preventing and eliminating safety and health hazards; (3) train, instruct and provide adequate supervision to ensure that its employees are aware of, and comply with, applicable Federal and State safety and health laws, standards, regulations and rules, safe healthful work practices and all applicable safety rules, regulations and work practices and procedures (4) not create any hazards or expose any of its employees, employees of the Owner and/or Construction Manager or employees of Contractors to any hazards; and (5) where the Contractor is aware of the existence of a hazard not within its control, notify the Construction Manager of the hazard as well as warn exposed persons to avoid the hazard.
- C. The Contractor / Sub-contractor shall prepare a written Job Hazard Analysis (JHA) common to the construction industry for any work of a high risk nature. This JHA will be prepared and signed by each work crew each day prior to starting work on a specific area of work and any time

a crew is re-assigned to a new work task. The JHA form is generally in table form and simply describes tasks to be performed, potential hazards and mitigating measures. The form is used to identify, analyze, understand and mitigate potential hazards associated with repetitive or potentially hazardous work operations. Each employee associated with the work to be performed shall be instructed by their companies designated Competent Person of the safety measures listed on the form and shall sign the document prior to the commencement of work. (examples of "high risk": pre-cast concrete, scaffold activities, steel erection, work at heights, work at depths, road work, etc.) If the contractor prepares a similar assessment form it must be reviewed to meet the criteria of a Job Hazard Analysis (JHA) as described by the U.S. Department of Labor (OSHA 3071 2002 Revised).

- D. The Contractor's Superintendent or Safety Supervisor shall immediately, verbally report, and promptly thereafter confirm in writing to the Construction Manager any unsafe conditions or practices that are observed, or violations of job safety which are not within the Contractor's control.
- E. Contractors shall immediately, verbally report, and promptly thereafter confirm in writing, to the Construction Manager any unsafe practices or conditions that are observed which are not under the Contractor's control.
- F. The Contractor's Superintendent or Safety Supervisor shall ensure that adequate first aid supplies are available, and that personnel are qualified to administer first aid/CPR, as required by State and/or Federal regulations.
- G. Every Contractor shall promptly notify Construction Manager of any personal injury requiring medical treatment of any of the Contractor's employees at the Project site; or of significant damage to property arising in connection with Contractor's performance, as promptly as possible after the occurrence of such injury or damage. Within twenty-four hours of such occurrence, Contractor shall furnish to Construction Manager a complete written report of such injury or damage.
- H. Contractor certifies that the forgoing terms shall be made applicable to all Contractors' subcontractors, suppliers, materialmen, or anyone furnishing labor and/or materials to the site.
- I. Every Contractor shall continue to educate their job Safety Supervisor or Superintendent of their responsibilities, which shall include:
 - 1. Instructing workers and subcontractors under its supervision in safe work practices and work methods at the time they are given work assignments.
 - 2. Ensuring that its workers and subcontractors have and use the proper protective equipment and suitable tools for the job.
 - 3. Continuously checking to see that no unsafe practices or conditions are allowed to exist on any part of his job.

4. Acquainting its workers and subcontractors with all applicable safety requirements and ensuring that they are enforced.
 5. Setting a good example for their workers.
 6. Making a complete investigation of incidents to determine facts necessary to take corrective action.
 7. Promptly completing an "Incident Investigation Form" with his Supervisor's assistance and distributing as required.
 8. Holding weekly "tool box" safety meetings with their employees to:
 - a. Discuss observed unsafe work practices or conditions including a review of current foreman meeting and progress meeting report.
 - b. Review each incident with their employees and discuss correction of incident root causes.
 - c. Encourage safety suggestions from his men.
 9. Seeing that prompt medical treatment is administered to an injured employee.
 10. Correcting or reporting immediately to project superintendent any observed unsafe conditions, practices or violations of job safety or security.
 11. Making all reports required by these Contract Documents to the Construction Manager in a full and timely fashion.
5. SAFETY MEETINGS
- A. The Contractor's Project Manager or Superintendent shall attend weekly or biweekly supervisory job meetings. The first topic of these meetings will be job site safety. The weekly safety reports will be reviewed, and violations must be corrected immediately. Contractors will be encouraged to participate in the on-going jobsite safety.
6. TOOL BOX SAFETY MEETINGS
- A. The Contractor shall schedule weekly "tool box" safety sessions to be held by their project safety supervisor or competent person / superintendent for all their employees.
 - B. A member of the Contractor's management staff shall periodically attend "tool box" safety sessions

to evaluate their effectiveness and offer any appropriate suggestions for improvement.

7. REPORTS

- A. Contractors shall report all accidents or injuries on a timely basis in accordance with all applicable regulations.
- B. Contractors shall promptly complete an incident investigation report of all incidents.
- C. A record of all "tool box" safety sessions shall be made and submitted to the Construction Manager.

8. SAFETY REPRESENTATIVE

- A. The Construction Manager (CM) may employ the services of a Safety Representative on the project.
- B. The CM Safety Representative will visit the job site on a weekly basis, or as necessary, to determine if the work is being performed in a safe manner and in accordance with OSHA, State and Local safety regulations. The CM Safety Representative is not responsible for observing and documenting all possible safety violations. The Contractors' Safety Representatives, Safety Supervisors, or Superintendents shall attend job site safety inspections with the CM Safety Representative.
- C. The CM Safety Representative will prepare a written report at the end of each inspection listing the safety violations observed during the inspection. This report will be distributed to all Contractors. Contractors will immediately correct all safety violations and provide written documentation to the CM verifying that all hazards have been corrected.

9. RIGHT TO STOP THE WORK DUE TO SAFETY VIOLATIONS

- A. The Construction Manager, in its sole discretion, may order the Contractor to stop the work due to safety violations under the following circumstances:
 - 1. If the Construction Manager observes the Contractor is violating safety regulations and the Contractor takes no immediate action to correct the violation.
 - 2. If the Contractor has been notified by the Construction Manager in writing that he is in violation of safety regulations and fails to take action to correct the violation within 24 hours of the notice.
- B. If the Construction Manager directs the Contractor to stop the work due to safety violation, it will be done in accordance with the General Conditions of the Contract. Contractor shall not be permitted an adjustment of the Contract Time or Sum for the days lost to any suspension of work.
- C. If the Construction Manager or Safety Representative observes Contractor's employee violating this safety program or OSHA Standards in a habitual manner, or creating a serious life safety

violation, the Construction Manager or Safety Representative may instruct the Contractor's superintendent or foreman to remove the violator from the work site for failure to comply with the safety program and the contract.

10. EMERGENCY PROCEDURES

- A. The Construction Manager shall establish a central meeting location for the assembly of all Contractors' employees in the event of a job site emergency.
- B. Contractors shall assemble all their personnel and account for all employees. Contractors must immediately report to the Project Superintendent with the status of their employees.

11. FALL PROTECTION PROCEDURES

- A. Contractors are responsible, in accordance with federal, state, local laws and regulations including OSHA, to provide and enforce their own site specific fall protection program and equipment. The following fall protection procedures shall be enforced by all Contractors as a minimum standard.
 - 1. All workers on walking/working surfaces with unprotected sides or edges six feet (6') or higher above the next lower level must be protected from falls by the use of guardrail systems, net systems, fall arrest systems or controlled access zone programs. It is intended that when fall protection is required, it is required 100% of the time. All contractors are reminded that relevant industry regulations require that contractors comply with the following standards.
 - a. Workers constructing or working near leading edges must be protected.
 - b. Workers on the face of formwork or reinforcing steel must be protected at a height of 6 feet (6') or greater.
 - c. Employees working from scaffolds shall be guarded / protected from falling 6 feet (6') above next lower level.
 - d. Brick layers performing overhand bricklaying and related work six feet (6') or higher above lower levels must be protected from falls.
 - e. Roofers must comply with OSHA regulations for roof work.
 - f. The Contractor's controlled access zone plan shall be included in their site-specific safety program and shall be submitted prior to the start of work. Contractors are responsible for assuring programs are OSHA compliant.
 - g. Guidelines for Residential Construction or any interpretations will not be accepted in lieu

of 1926 Standards.

- h. Contractors must provide certification per OSHA CFR29 § 1926.503(b) of employee training and retraining on fall protection upon request.
- B. Contractor shall provide their own fall protection. Fall protection may be provided by guardrail systems, net systems, or personal fall arrest systems. All fall protection systems must comply with OSHA regulations.
- C. Stepladders, exposed to shafts or edges of the building, greater than six feet (6') above the next lower level, must be tied off or otherwise secured. Employee must wear fall protection, i.e., harness/lanyard.
- D. The Safety Cable System shall not be altered or removed without a written request submitted to the Project Manager with a copy to the Superintendent. It shall be the responsibility of each Contractor that is removing or altering the Safety Cable System to maintain the fall protection safety provided by the safety cable and not leave the area unprotected. Each Contractor shall be responsible to re-install the Safety Cable System immediately after work is completed. Each Contractor shall be responsible to re-install the Safety Cable System in accordance with OSHA regulations.
- E. Fall protection will be enforced for Structural Steel Erectors.
 - 1. Contractors engaged in structural steel erection are specifically advised that structural steel erectors shall comply with all protection requirements for all work at a height of six feet (6') or greater above the next lower level, 100 percent of the time, by any of the following means.
 - a. Standard guardrail system.
 - b. Personal Fall Arrest System (PFAS) – full body harness with shock absorbing lanyard. PFAS must meet the requirements of CFR 1926 subpart M.
 - c. Access to work area shall be provided by ladders or other safe methods. There shall be sufficient number of ladders, or other safe methods, available to reduce the amount of “beam walking.” When it is absolutely necessary to traverse a beam, 100% fall protection must be utilized.
 - d. Steel erection Contractors must, at all times, be able to certify in writing that each of their employees have been properly trained in both OSHA fall protection standards and the Contractor’s site specific project fall protection procedures.
 - e. Prior to the erection of the steel, the Contractor shall meet with the Project Manager and Safety Representatives to review and document site specific procedures.

12. AIRBORNE CONTAMINENTS PROCEDURES

- A. Contractors must provide and use equipment furnished with Exhaust Purifiers / Scrubbers when any equipment produces airborne contaminants and will be used in an enclosed building.
- B. The Contractor shall verify air quality by the use of air monitoring equipment and document such verified air quality on the daily report. The monitoring equipment shall, at a minimum, be designed with an auditory alarm and shall provide continuous monitoring of these four gases: Oxygen, Hydrogen Sulfide, Carbon Monoxide and Combustible gases.
- C. The Contractor must provide administrative or engineering controls to protect its workers from exposure to occupational health, environmental or other hazards to be implemented whenever feasible. When such controls are not feasible to achieve full compliance, protective equipment or other protective measures shall be used to keep the exposure of employees to air contaminants within the limits prescribed by local, state, and federal regulations. Any equipment and technical measures used for this purpose must first be approved for each particular use by a competent industrial hygienist or other technically qualified person. Whenever respirators are used, their use shall comply with 1926.103.

13. CELL PHONE AND RADIO USE POLICY

- A. Use of cell phones on EDiS Company projects should be limited to non-construction type activity areas and away from active construction areas (i.e., project office). This includes both cell phone use and the review of data, information, texts, and the internet. Except in an emergency circumstance, phones should only be used in the designated areas. Anyone observed using a cell phone outside of these designated areas without regard to maintaining a safe focus on their surroundings can be subject to discipline, up to and including removal from the project. Use of ear buds, ear phones, and portable radios are absolutely prohibited on EDiS Company project sites. Anyone using ear buds, ear phones, or any other device that would prevent the wearer from receiving auditory cues about the surrounding environment will be subject to discipline, up to and including removal from the project.

14. EXCAVATION PROCEDURES

- A. Before ANY excavation work is to commence, the Contractor/Excavator shall contact the utility companies or utility owners and advise them of the proposed work and ask them to mark the location of the underground utility installations. This notification shall be done within established or customary local response times. If the work is on private property and the utility company will not mark out the utilities, the Contractor/Excavator will hire a private locating service to mark the utilities. Once the utilities are located and marked, the Contractor/Excavator will excavate by hand or use a vacuum truck to expose the utilities and record the exact location and elevation of the utilities.
- B. The Contractor/Excavator must submit the Excavation Permit to EDiS Company verifying their

assurance of communication with the utility companies or utility owners. The Contractor/Excavator must follow State, Local, and Federal Guidelines prior to proceeding with excavations. The Contractor/Excavator will have these marks restored as long as there is work to perform.

- C. Once the Contractor has installed new utilities, they will provide to EDiS Company an as-built drawing, within 7 days, showing the exact location and elevation of the utilities. The installing Contractor will be responsible for locating and marking these utilities for other contractors that may have work in the same area.
- D. Definition: "Excavator" shall mean any person, including those acting either as an employer or employee, intending to perform or performing excavation or demolition work.
- E. Definition: "Excavate" or "Excavation" shall mean any operation in which earth, rock or other material in the ground is moved, removed, or otherwise displaced or disturbed by means of any tools, equipment or explosives and includes, without limitation, grading, trenching, digging, dredging, ditching, drilling, auguring, tunneling, boring, backfilling, post pounding, driving objects into the ground, installation of form pins, hammering, scraping, cable or pipe plowing or driving.

15. TRAFFIC CONTROL PROCEDURES: Manual or Uniform Traffic Control Devices (MUTCD)

- A. Traffic control plan(s) for the work may be required by the Authorities Having Jurisdiction (AHJ). Traffic control plans, if required, shall be prepared per AHJ standards, at the Contractor's expense, for review and approval by the AHJ. (Note: anything on a public right of way controlled by the state will require an engineer's stamp.) The implementation of the traffic control plan and any associated maintenance shall be performed at the Contractor's expense in accordance with the requirements of the AHJ. All warning signs and safety devices used by the Contractor to perform the work shall conform to the requirements contained in the State where the work is being performed, and the Department of Transportation's current edition of "Manual on Uniform Traffic Control Devices". The Contractor shall also be responsible for all traffic control required by the AHJ over the Project on the intersecting streets.
- B. Contractors must submit a traffic control plan to the AHJ over the project for approval within fourteen (14) calendar days of Contract award. The approved traffic plan must be submitted prior to the commencement of work in a public street. The Contractor's representative on the site responsible for traffic control shall produce evidence that he/she has completed training acceptable to the Department of Transportation for safety through construction zones. All of the streets in which the work will occur shall remain open to traffic and one lane of traffic maintained at all times unless otherwise directed by the AHJ. Businesses and residences adjacent to the work shall be notified forty- eight (48) hours in advance of closing of streets, roadways, driveways, etc. The Contractor shall make every effort to minimize the amount of public parking temporarily eliminated due to construction in areas fronting businesses. No stockpiles of pipe or other material will be allowed in traveled right-of- ways unless otherwise approved. These requirements shall not authorize any extension of time for performance of this Contract.

16. SCAFFOLDING PROCEDURES

- A. A written project specific scaffold inspection checklist must be completed by the Contractor's competent person responsible for inspecting the scaffolding before each work shift, and after any occurrence which could affect a scaffold's structural integrity. A copy of the documented scaffold inspection checklist must be maintained by each company performing work on a scaffold and a second copy provided for record to the EDiS project office.
- B. Contractors are required to ensure that all employees working on or around scaffolding are properly trained. Contractors shall provide documented verification of scaffold training upon request.
- C. Scaffold erectors and dismantlers are required to wear fall protection during the erecting, modifying and dismantling scaffolds. In cases where fall protection is infeasible or creates a greater hazard, the competent person shall document their decision at each specific location of scaffold assembly. At minimum, the scaffold erectors and dismantlers shall wear a fall protection harness during the erection, modification and dismantling of scaffolds.
- D. Contractors shall utilize a scaffold tag system. The scaffold tag system shall be color coded and visible. The competent person shall sign and date the scaffold tag.
 - 1. Green tags are reserved for complete systems.
 - 2. Red tags are reserved for erection/dismantling activities and for scaffolds with deficiencies in the system.
 - 3. Yellow tags are reserved for systems that require the use of both PFAS and guardrail systems for incomplete scaffold systems or platforms.

END OF SECTION

SECTION 10 14 23 PANEL SIGNAGE

PART 1 - GENERAL

1.1 SUMMARY

A. Work Results:

1. Room identification and code-required signs identified as acrylic on the drawings.
2. Tempered glass elevator lobby directory signage as shown on the drawings.
3. Mounting wall preparation, including blocking and wall accuracy/flatness to allow mounting of glass signage (and adjacent porcelain tile) in elevator lobbies.
4. Evacuation plans digitally back-printed on 1/4" acrylic signs, with "you are here" dots coordinated for each individual location at each floor of public and service elevators.

B. Principal Products:

1. Acrylic signs: Back-Painted for custom background color and custom color graphic directory divider lines. Raised **custom color** characters and contrasting braille for ADA compliance. Braille to be typically dark gray similar to SW2819 over a light tan background.
2. Glass signs: 1/4" clear tempered glass signs with polished edges and 1 mm 45 degree polished bevels at all edges, front and back of glass. Back-painted and/or digitally printed color fields at elevator lobbies. Custom color back-applied background with custom color back-applied graphic divider elements. Lettering and floor numbers solid **custom color** acrylic mounted on front side of the glass. Acrylic letter thickness varies from 1/16" to 3/16" depending on location and size of font, as shown on the drawings.
3. Colors that require matching for back-painting include P1 and P7. Other colors that require custom match in solid acrylic are shown below.

SIGNAGE COLOR KEY - MATCH THE REFERENCE COLORS NOTED BELOW



P1

MFR: SHERWIN-WILLIAMS
SW 7567 NATURAL TAN



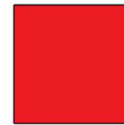
P2

MFR: SHERWIN-WILLIAMS
SW 2819 DOWNING SLATE



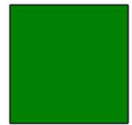
P3

MFR: SHERWIN-WILLIAMS
SW 7757 HIGH REF. WHITE



P4

STANDARD RED
RGB: 237/28/36



P5

STANDARD GREEN
RGB: 000/128/000



P6

STANDARD BLUE
RGB: 33/64/154

USED FOR THE ADA SYMBOL
ON THE EMERGENCY EXIT
PLANS



P7

MFR: SHERWIN-WILLIAMS
SW 7547 SANDBAR



P9

STANDARD BLACK
RGB: 0/0/0



M5

ALUMINUM. CAST, EXTRUDED,
OR SHEET METAL
MFR: CHEMETAL FOR SHEETS
FINISH: #902 IF CHEMETAL OR
BRUSHED #4 CLEAR ANODIZED
ALUMINUM FROM OTHERS.

USED FOR MOUNTING
BRACKETS OF FIRE
EXTINGUISHER SIGNS

1.2 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting Attendees and Procedures:

1. Conduct site coordination meeting with construction manager one week, minimum, before starting installation and verify readiness of field conditions and timing with construction manager so signage is not damaged by other trades.

1.3 ACTION SUBMITTALS

A. Product Data:

1. Each type of sign.
2. Initial Selection: Sign styles, color charts, and color samples.

B. Shop Drawings: Sign styles, lettering font, foreground and background colors, overall dimensions of each sign. Digital full color proofs of each type of sign

C. Schedule: Locations of each type of sign, description of graphics, and message text.

D. Samples, full size: Each type of sign. Acceptable samples of acrylic signs may be installed in the Work. Acceptable samples of glass signs SHALL be installed in the work if feasible. Transportation of sign samples to and from the construction manager and architect's office shall be the responsibility of the contractor, coordinating the timing with architect & construction manager, including pickup of approved signs for use in the work.

E. After shop drawing approval, field install one typical room designation sign of each type including on office sidelite, and send photos of the work for approval before installing the remainder.

1.4 CLOSEOUT SUBMITTALS

A. Maintenance data. Data on removal of acrylic from glass in order to change directory information in the future.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Package signs labeled in name groups.

B. Store adhesive attachment tape at ambient room temperatures.

1.6 FIELD CONDITIONS

A. Ambient Conditions: Perform work within following limitations:

1. Building enclosed and environmental systems maintaining design conditions for Owner occupancy.

PART 2 - PRODUCTS

2.1 INTERIOR ROOM IDENTIFICATION AND CODE-REQUIRED SIGNS

A. Room Identification and Code-Required Signs: Back-Painted, Raised character acrylic plastic signs as shown on the drawings. Some with changeable slide occupancy strip or

an insert strip area for owner-printed names. Include ADA-compliant Grade 2 braille characters where required and where shown on the drawings.

1. Suppliers:

- a. Pro Signs (Downingtown, PA)
- b. APCO Graphics, Inc.
- c. A. R. K. Ramos Signage Systems.
- d. ASI Sign Systems, Inc.
- e. Gemini Incorporated.

2. Panel: 1/4 inch P-95 clear back-painted/printed acrylic or as shown on drawings.

3. Sizes, Shapes: See Drawings.

4. Edges: Square, Polished.

5. Character Style: Architect selected ADA-compliant characters.

6. Colors: Architect selected.

7. Graphics: As shown on the drawings.

8. Mounting: Double-side foam core adhesive tape. Ensure mounting will not be visible through sign.

9. Mounting on glass: Utilize a permanent mounting method for 1/4 inch thick signs and 1/8 inch thick matching blank plate on opposite side of glass. Many room signs will be mounted on the full height glass sidelite adjacent to the doors. Coordinate locations using the drawings. Provide and install matching size and color 1/8" thick back painted acrylic blank sign plates on the interior of the glass to conceal the mounting method from the opposite side. Center the signs horizontally on the glass sidelite unless shown otherwise on the drawings. Install one sample and provide photos for approval before continuing installation.

B. Tempered glass signs for elevator lobbies, with graphics and field colors painted and/or digitally printed on the back side of the glass, and acrylic numbers and letters mounted on the front side. Install with a Z-clip system that will not be visible through the sign. Ensure mounting will not be visible through sign.

1. Suppliers:

- a. Pro Signs (Downingtown, PA)
- b. APCO Graphics, Inc.
- c. A. R. K. Ramos Signage Systems.
- d. ASI Sign Systems, Inc.
- e. Gemini Incorporated.

2. Glass Thickness: 1/4 inch, clear tempered.

3. Sizes, Shapes: See Drawings.

4. Edges: 45 Deg Bevel front and back (1mm bevel) Polished.

5. Character Style: As shown on the drawings.

6. Colors: Architect selected.

7. Graphics: As shown on the drawings.

8. Mounting: Horizontal low profile metal rail Z-clip system. Minimum standoff for glass shall be 1/4" from wall. Maximum standoff shall be 5/16". Horizontal joint size between adjacent pieces of glass: 3/16" or as shown on the drawings. Vertical joint size between adjacent pieces of glass: 1/8" or as shown on the drawings. Joints shall appear

consistent across aligned pieces.

2.2 DESIGN CRITERIA

- A. Accessibility Requirements: Applicable provisions in Department of Justice publication 2010 ADA Standards for Accessible Design and ICC/ANSI A117.1.

2.3 MATERIALS

- A. Acrylic Sheet: ASTM D4802, manufacturer standard, Type UVF (UV filtering).
- B. Adhesives and Tape: Zero VOC.
- C. Tempered glass as described above, and hidden mounting system.

2.4 FABRICATION

- A. Factory assemble signs.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Clean substrates to ensure secure adhesive mounting.

3.2 INSTALLATION

- A. Install signs after doors and wall surfaces are finished.
- B. Follow accessibility requirements.
- C. Install signs plumb and level.
- D. Install signs with adhesive to lay flat against wall.
- E. Clean signs after installation.
- F. *Any signs where the mounting adhesive, tape, hardware or other such mounting indications show through to the visible portions of glass or acrylic panels will be rejected and must be replaced using a satisfactory method. Sign installer is expected to coordinate methods with construction manager and architect, including field-installed samples if needed, to avoid installation problems.*

3.3 SIGN LOCATIONS

- A. Locate signs as shown on the Signage Package drawings.

3.4 SUPPORT FOR GLASS SIGNS & DRYWALL TOLERANCES

- A. Install minimum 3/4" thick fire retardant treated wood blocking between metal studs behind drywall finish in locations that receive Z-clip fasteners. Face of blocking shall be tight to back side of drywall.
- B. Install drywall in areas of glass signage to meet flatness criteria of signage installation company to allow proper fastening of Z-clip system.

END OF SECTION

SECTION 27 41 00
GENERAL CONDITIONS FOR INTEGRATED SYSTEMS

PART 1 - GENERAL

1.1 REFERENCE TO OWNER'S GENERAL CONDITIONS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other contract documents, apply to this Section.

1.2 RELATED DOCUMENTS

- A. Refer to the following Sections for specifications related to the Work:
 - 1. Section 27 41 16 – Audiovisual Specification

1.3 RELATED WORK

- A. AV Contractor shall coordinate with the General Contractor on all locations for audio visual equipment and routing of audio, video, control, and power cables/raceway from equipment, terminal and pull boxes to system equipment racks, where applicable.

1.4 DEFINITIONS

- A. The following shall serve as general identifiers as specified herein:
 - 1. Owner – Kent County
 - 2. Contractor – The Contractor is the firm submitting a proposal to furnish and install the Work as defined within this Specification.
 - 3. Project – The Project is the Audiovisual Systems installation in the renovated space, for the Owner.
 - 4. Work – The term “Work” means all construction and services specified within this document. The Work includes all related labor, materials, equipment, and services provided, or to be provided, by the Contractor to fulfill the proposal’s obligations.
 - 5. Drawings – The term “Drawings” means all Audiovisual Systems Drawings and associated sketches, details, riser diagrams, etc.
- B. As used in the Drawings and Specifications for the Work, certain non-technical words and phrases shall be understood to have specific meanings as follows, regardless of indications to the contrary in the General Conditions or other documents governing the Work.
 - 1. “Furnish” – Purchase and deliver to the project site, complete with every necessary appurtenance and support, all as part of the Audio Visual Systems Work. Purchasing shall include payment of all sales taxes and other surcharges as may be required to assure that purchased items are free of all liens, claims, or encumbrances.
 - 2. “Install” – Unload at the delivery point at the site and perform every operation necessary to establish secure mounting and correct operation at the proper location in the project, all as part of the Work.
 - 3. “New” – Manufactured within the past year and never before used.
 - 4. “Provide” – Furnish and Install.
 - 5. “OFE” – equipment to be provided by the Owner

- C. Regardless of their usage in codes or other industry standards, certain words or phrases as used in the Drawings or Specifications for the Work, shall be understood to have the specific meanings as ascribed to them in the following list:
1. "Circuitry" – Any Work which consists of wires, cables, raceways, and/or specialty wiring method assemblies complete with associated junction boxes, pull boxes, outlet boxes, joints, couplings, splices, and connections except where limited to a lesser meaning by specific description.
 2. "Concealed" (as applied to circuitry) – Covered completely by building materials, except for penetrations (by boxes and fittings) to a level flush with the surface as necessitated by functional or specified accessibility requirements.
 3. "Exposed" (as applied to circuitry) – Not covered in any way by building materials.
 4. "Normal Work Conditions" – Locations within building confines that are not damp, wet, or hazardous and that are not used for air handling.
 5. "Patch Panel" – A System of terminal blocks, patch cords, and backboards that facilitate administration of cross-connecting cables.
 6. "Raceway" – Any pipe, duct, extended enclosure, or conduit (as specified for a particular System) which is used to contain wires and which is of such nature as to require that the wires be installed by a "pulling in" procedure.
 7. "Riser" – Shall refer to the portion of the installation that transmits between building floors (or between Audiovisual Systems rooms), also referred to as "Backbone Cabling".
 8. "Audiovisual Closet" – The enclosed area or room specifically designated for the routing, termination, and/or cross connecting of Audiovisual Systems cable (i.e. riser cable) to other Audiovisual Systems cable and/or equipment.
 9. "AV System(s)" – Audiovisual System(s), includes all components contained herein that work in conjunction to create and completely integrated and fully functioning system as described within the Drawings and Specifications

1.5 SCOPE OF WORK

- A. General: Provide audiovisual systems design, engineering, and installation within the building. Systems are to include all devices, equipment, installation, programming and commissioning in accordance with requirements of the contract documents and drawings.
1. The Work detailed within the Contract Documents has been specified to meet certain requirements for performance, appearance, and costs. It shall be the responsibility of the Contractor to implement the guidelines and requirements contained in the Contract Documents and translate them into a complete design package containing all elements necessary for a complete, operational, and functionally integrated Audiovisual System(s).
 2. Provide all work as detailed in the Contract Documents as a turnkey installation including all material, labor, engineering, warranties, taxes, freight, and permits. Only items and requirements specifically stated to be provided by others shall not be a requirement for this Section of the Work.
- B. Work Specified Elsewhere
1. Installation and termination of network systems.
 2. Cutting, patching and painting of walls, unless damaged performing the work described herein.
 3. Moveable furniture, desks, and chairs.

C. Coordinated Work

1. Coordinate with related trades to schedule the Work and ensure a complete installation in accordance with the schedule outlined by the Owner.
2. Coordinate all IP device requirements with the Data vendor, Owner, and Contractor.
3. Coordinate all network connectivity requirements with the low voltage cabling contractor and Owner.
4. Coordinate all wall blocking/backing to support AV device mounting.
5. Coordinate all projector mount structure and location
6. Provide NEMA electrical power conditioning components for installation by the Electrical Contractor in a timely manner.

1.6 GENERAL CONDITIONS

- A. The Contractor represents that they are familiar with, and have expertise in the Work of this nature and scope. The Contractor further agrees that they shall provide all Work as may be required to make a complete job of that which may not be fully defined in the Programmatic Documents.
- B. The Contractor shall comply with all of the regulations, including safety regulations of national, city, local and other government agencies having jurisdiction concerning the work of the Contractor. The Contractor shall give all notices and comply with all laws, ordinances, codes, rules, and regulations bearing on the conduct of the Work. If the Contractor performs any work, which is contrary to such laws, ordinances, codes, rules and regulations, they shall make all changes for compliance and bear all associated costs.
- C. The Contractor shall be responsible to provide and maintain a storage facility. If this storage facility is required to be on-site it shall be the Contractor's responsibility to coordinate the size and spatial requirements with the Owner. The Contractor shall assume full responsibility for the storage facility and all contents, unless otherwise indicated by the Owner.
- D. The Contractor shall provide all protection necessary to safeguard their work from damage by their operations and the operations of others. Unless the Contractor proves to the Owner's satisfaction that the Work has been damaged by others, the Contractor shall promptly repair, adjust, and clean all defective installations and bear all associated costs.
- E. All of the Contractor's work shall be tested and inspected by all authorities having jurisdiction and in accordance with all Specifications. The Contractor shall coordinate and cooperate fully and shall provide at no additional cost to the Owner, manpower, blueprints, facilities, scaffolds, etc. to reasonably assist the inspectors.
- F. The project documentation is, in general, diagrammatic and/or developed to communicate design intent. The Contractor shall coordinate the installation of all devices and/or equipment with the Owner prior to installation based on the existing field conditions.
- G. The Contractor shall examine the site and the Programmatic Documents and review with the Owner the designated areas of access, delivery, and storage for the Contractor's

use. The Contractor agrees that such areas are satisfactory and sufficient for their needs in the completion of their work and in conformance with the terms of this Contract.

- H. The Owner reserves the right to furnish any materials necessary for the Project.
- I. All permits required for any part of the Contractor's work shall be procured and paid for by the Contractor. The Contractor shall determine all permits required and transmit this information to the Owner.
- J. The Contractor warrants that both they and their subcontractors are licensed as required by the authorities having jurisdiction and as required by local ordinances.
- K. The Contractor must state if they intend to utilize a subcontractor, and provide said subcontractor's name and address. The subcontractor shall comply with all the same rules, regulations, laws and codes, licenses, etc. as required by the Contractor and as specified herein. The Owner reserves the right to approve or disapprove any subcontractor proposed by Contractor.
- L. The Owner shall provide to the Contractor AutoCAD backgrounds for all required floor plans for the facility. All pre-fabrication and record drawings required for the Project and as stated herein, shall be completed within the latest version of AutoCAD.
- M. The Contractor, upon receiving notice from Owner that the Contractor has furnished inferior, improper or unsound work or materials (including equipment), or work or materials at variance with that which is specified, will, within 24 hours, proceed to remove such work or materials and make good all other work or materials damaged thereby, and, at the option of the Owner, the Contractor shall immediately replace such work or materials with work or materials as specified. The removal, replacement, and repair shall be performed at such times and with manpower sufficient, in the judgment of the Owner, so as to avoid disturbance to occupants, or other ongoing work for the Project.
- N. If the Contractor does not remove such unsound Work within a reasonable time, the Owner may remove it and may store the material at the expense of the Contractor. If the Contractor does not pay the expenses of such removal within ten (10) days time thereafter, the Owner may, upon written notice, sell such materials at auction or at private sale and shall account for the net proceeds thereof, after deducting all the costs and expenses that should have been borne by the Contractor and all expenses of the sale.
- O. The Owner shall have the authority at all times, until final completion and acceptance of the Work, to inspect and reject work and materials which in its judgment are not in conformity with the Drawings and Details, and Specifications, and its decision in regard to character and value of Work shall be final and conclusive on both contracting parties. If the Owner permits said Work or materials to remain, the Owner shall be allowed the difference in value or shall at its election have the right to have said Work or materials repaired or replaced, as well as the damage caused thereby, at the expense of the Contractor, at any time within one (1) year after the completion of the entire project, or within such longer period as may be covered by any guaranty; and neither payments made to the Contractor, nor any other acts of the Owner, shall be construed as evidence of acceptance, waiver, or estoppels.

- P. Any expense incurred by the Owner in connection with the foregoing, shall be borne by the Contractor, and the Owner may withhold money due to the Contractor or recover money already paid to the Contractor, to the extent of such expense.
- Q. It shall be understood that Specifications and Drawings are complementary. Where there are conflicts within the documents, the overall design intent shall govern.
- R. To the extent that they govern the Work, the Program documents, Specifications and Drawings also govern change order Work, if any.
- S. The Drawings for the Work utilize symbols and schematic diagrams that have no dimensional significance. The Work shall be installed to fulfill the diagrammatic intent expressed on the Drawings, field layouts, and shop drawings of all trades
- T. Certain details appear on the Drawings for the Work that are specified with regard to the dimensioning and positioning of the Work. These are intended only for general information purposes. They do not obviate field coordination for individual items of the indicated Work.
- U. Information as to general construction and architectural features and finishes shall be derived from the structural and architectural drawings and specifications, may require ongoing coordination with the Design Professional.
- V. Ratings of devices, materials, and equipment specified without reference to specific performance criteria shall be understood to be nominal or nameplate ratings established by means of industry standard procedures.
- W. It is the intent of the Drawings and Specifications to provide complete operating Audio Visual Systems. All Work necessary to provide such a System shall be performed. Any discrepancies shall be brought to the Owner's attention.
- X. The Work called for under this Contract shall be carried on simultaneously with the Work of other trades and Owner functions in such a manner as to not delay the overall progress of the construction project. The Contractor is responsible for all coordination of the Work with other trades.
- Y. Include in the Work all necessary supervision and issuing of all coordination information to any other trades who are supplying work to accommodate the Audio Visual Systems installation.
- Z. For items of equipment which are to be installed but not purchased as part of the Work, the Work shall include:
 - 1. Coordination of delivery
 - 2. Unloading from delivery trucks
 - 3. Safe handling and field storage up to the time of permanent placement in the project
 - 4. Correction of any damage to the item(s)
 - 5. Mounting in place and connection(s) as specified
- AA. Items which are to be installed, but not purchased as part of the Work shall be carefully examined upon delivery to the project. Claims that any of these items have been

received in such condition that their installation will require procedures beyond the reasonable scope of the Work will be considered only if presented in writing within one (1) week of the date of delivery to the project of the items in question. The Work includes all procedures necessary to put in satisfactory operation all items for which no claims have been submitted as outlined above.

- BB. It is the Contractor's responsibility to ensure that the information is complete and accurate. Any errors or omissions in the ordering information will be the responsibility of the Contractor.

1.7 PROJECT MANAGEMENT

- A. The Contractor shall provide a Project Manager to oversee and coordinate all activities on the Project
- B. Project Manager's Duties and Responsibilities:
1. The Contractor shall provide to the Owner, as a part of the prefabrication submittal, the name of the Project Manager that will provide all duties and responsibilities as specified herein, during the term of the project.
 2. The Project Manager shall maintain the ability of making all managerial decisions on behalf of the Contractor on a day-to-day basis, and shall retain the authority of accepting notices of deduction, inspection reports, payment schedules and any other project related correspondence on behalf of the Owner.
 3. The Project Manager shall schedule and attend project management meetings, during which time all System related issues are discussed, scheduled, confirmed, and/or resolved.
 4. The Project Manager shall be available during normal business hours and within two (2) hours by telephone during the term of the project.
 - a. After normal business hours, the Project Manager shall be available within four (4) hours by telephone during the term of the project.
 - b. In the event that the Project Manager is not available within the allotted time frame, the Contractor may designate another employee to temporarily act as the Project Manager in all correspondence with the Owner.
 - c. The Contractor shall ensure that any individual temporarily assuming the duties of the Project Manager is at equal or higher level in the Contractor's managerial chain of command.
 5. Upon notification by the Owner, of any project related installation issue, or issue that may contradict the Specifications as stated herein, the Project Manager shall respond to such issue, verbally and/or in writing within an eight (8) hour period
 - a. Responses to such issues as stated above shall include a clear understanding of the issue, along with a tentative plan of action, reflecting milestones and/or deadlines to resolve the issue.
 - b. Where appropriate, based on the overall importance of the project issue, the Project Manager shall follow-up their initial response with a written response to the issue within 24 hours of identification of the issue.
 6. Prior to the initiation of the Work, the Project Manager shall submit a schedule reflecting key milestones of the Work, including but not limited to the following:
 - a. Offer award
 - b. Kick-off meeting
 - c. Submittals
 - d. Ordering and delivery of equipment

- e. On site wire pull
 - f. Rack Fabrication
 - g. Field equipment installation
 - h. Control System programming
 - i. Project management schedule
 - j. Installation completion date
 - k. System training
 - l. Delivery of As-Built documentation
 - m. Delivery of Operations & Maintenance Manuals
 - n. Final System test
 - o. Acceptance of System
7. The Project Manager shall update the schedule on a weekly basis to reflect the status of each key milestone as the Work progresses.
8. As the System installation progresses, the Project Manager shall be capable of discussing any/or all of the above mentioned items at the request of the Owner, and shall address each item, as it relates to the current status of the Work.

1.8 REFERENCES

- A. The Audiovisual Systems shall be installed in accordance with the latest applicable revisions pertaining to all applicable national, state, and local codes and standards including, but not limited to the following:
- 1. International Building Code (IBC)
 - 2. NFPA-72 National Fire Alarm and Signaling Code
 - 3. International and National Electric Codes (IEC/ NEC)
 - a. IEC 60268-16 Third Edition 2003-05 Objective rating of speech intelligibility
 - 4. ANSI/Infocomm
 - a. 1M:2009 Audio Coverage Uniformity Standard in Enclosed Listener Areas
 - b. 2M:2010 Standard Guide for Audiovisual Systems Design and Coordination
 - c. 3M:2011 Projected Image System Contrast Ratio
 - d. X3T9.5 FDDI
 - e. X3T9.5 CDD
 - 5. Sustainable Technology Environments Program
 - 6. Underwriters Laboratories, Inc. (UL)
 - 7. Society of Motion Picture and Television Engineers (SMPTE)
 - 8. Building Industry Consulting Service International (BICSI)
Telecommunications Distribution Methods Manual – latest edition
 - 9. ANSI/TIA/EIA-568-B – Commercial Building Telecommunications Cabling Standard
 - 10. ANSI/TIA/EIA-569 – Commercial Building Standards for Telecommunications Pathways and Spaces
 - 11. ANSI/TIA/EIA-606-A. Administration Standard for Commercial Telecommunications Infrastructure
 - 12. ANSI J-STD-607-A, Commercial Building Grounding (Earthing) and Bonding Requirements for Telecommunications
 - 13. EIA RS-232 Serial Communications Electrical Interface
 - 14. EIA RS-310-C Racks, Panels and Associated Equipment
 - 15. FCC Part 15
 - 16. FCC Part 68
 - 17. IEE 802.3
 - 18. IEEE 802.5

19. Article 770 Optical Fiber Cables
20. Article 800 Communications Circuits
21. NFPA 70 National Electrical Code
22. NFPA 75 Protection of Electronic Computer/Data Processing Equipment
23. United States Green Building Council (USGBC); Leadership in Energy & Environmental Design(LEED): Green Building Rating System for New Construction & Major Renovations (NC) Version 3.0 (2009) www.usgbc.org

- B. Submit references for three projects completed within the last 3 years with similar size and scope criteria to the Project. Submit project details including quantity and fit-out of audio spaces, quantity and type of mixing systems, quantity and type of amplification systems, etc.

1.9 SYSTEM DESCRIPTION

- A. Any item not specifically shown on the drawings or called for in the specifications, but normally required to conform to the intent, are to be considered as part of the Work.
- B. Any given item of equipment or material shall be the product of one manufacturer throughout the facility. Multiple manufacturers of any one item will not be permitted, unless specifically noted otherwise.
- C. These specifications are equipment and performance specifications and are considered to be one all encompassing package with the drawings. Actual installation shall be as engineered by the CONTRACTOR with prior approval by the Design Professional.
- D. Provide audiovisual devices and equipment with performance levels and capacities as noted herein.

1.10 SUBMITTALS

- A. Furnish submittals in accordance with general requirements specified in Division 1, SUBMITTAL PROCEDURES
- B. Prefabrication Submittals
1. Submit pre-fabrication submittals in accordance with the Owner's construction schedule.
 2. Pre-fabrication submittals shall consist of product data, shop drawings, samples, and a detailed completion schedule. Partial submittals will not be accepted without prior written approval from the Design Professional.
 3. Pre-fabrication submittals shall be furnished in electronic formats as defined by the General Conditions under Part 1 of the Project Specifications.
 4. No portion of the Work shall commence nor shall any equipment be procured until the Design Professional has approved the pre-fabrication submittals in writing.
 5. A letter of transmittal identifying the name of the Project, Contractor's name, date submitted for review, shall accompany pre-fabrication submittals and a list of items transmitted.
- C. Product data required as part of the pre-fabrication submittal shall include the following:
1. Submit manufacturer's product data sheets for all materials and equipment proposed for use on the project sorted by room and indexed.
 2. Submit manufacturer's product data sheets for all fire stopping materials proposed

- for use on the project.
3. Equipment schedules listing all System components, manufacturer, model number and the quantity of each
 4. General functional descriptions for each System
 5. Manufacturer's data specification sheets for all System components, including any warranty information.
 - a. Mark each product data sheet to show applicable choices and options (sheets containing more than one device or component model number shall be clearly marked to delineate items included in the Work)
 - b. Manufacturer's Data: For each manufactured device submit manufacturers' specifications and print photograph of the proposed device. Include engineering descriptions, principle of operation, application, and proposed model, style or size clearly indicated.
 6. A complete list of cable and wiring types, sizes, manufacturer, and model number
 7. A complete list of finishes and sample graphics, including custom art work and custom graphics (if applicable)
 8. List of parts inventory to provide manufacturer recommended service and maintenance of the Work
- D. Shop Drawings shall include the following:
1. Detailed plan views and elevations of AV Control and/or Headend rooms (in addition to relevant telecommunications rooms) showing raceway, sleeves, cable tray, cable paths, equipment racks, equipment cabinets, termination blocks, power receptacles and grounding bus bars.
 2. Drawings to show evidence of coordination with other trades.
 3. Cable run sheets denoting cable type, signal type, termination type, cable number designation, start point and end point.
 4. Cable termination schedules showing cable transmission and device location. Provide schedules in printed and electronic format.
 5. Floor plan drawings indicating device locations with device legends
 6. System riser diagram with all devices, wire runs, and wire designations
 7. Schematic block diagrams for each System showing all equipment, interconnects, data flow, etc.
 8. Wiring diagrams for each subsystem defining the interconnection of all inputs and outputs for all equipment
 9. Fabrication shop drawings for all custom equipment (if applicable)
 10. Plans and elevations of the Audiovisual equipment racks and/or custom furniture (including consoles, desks, and lecterns) quantifying all equipment to be mounted therein
 11. The Contractor shall submit samples of any equipment components upon request of the Owner. Samples submitted shall be the latest version of equipment.
 12. It is the responsibility of the Contractor to confirm all dimensions, quantities, and the coordination of materials and products supplied by the Contractor with other trades. Approval of shop drawings containing errors does not relieve the Contractor from making corrections at their expense.
- E. Record Documentation shall include all information required in the Pre-fabrication Submittals but revised to reflect "as installed" conditions.
1. General Description and Requirements
 - a. Submit Record Documentation in accordance with the Design Professional's construction schedule.

- b. Record Documentation shall consist of Record Drawings and Operation and Maintenance Manuals.
 - c. Provide a letter of transmittal with Record Documentation identifying the name of the Project, Contractor's name, date submitted for review, and a list of items transmitted.
 - d. Prior to the final acceptance of the Work, submit two draft sets of the Record Drawings portion of Record Documentation to the Design Professional. The draft copy shall be used during the final acceptance testing by the Design Professional.
 - e. Update all record documentation to reflect changes or modifications made during final acceptance testing as required and submit three blue/black lines and one reproducible set.
 - f. Provide cable test results for all cables installed under this Work, tested and documented as described herein.
 - g. Provide Owner with Operation and Maintenance Manuals including wiring diagrams, parts lists, shop drawings and manufacturers' information on all equipment and cables provided by the Contractor. Manuals shall be provided in a high quality, 3-ring binder and completely indexed.
 - h. Provide Owner with all systems programming on electronic media. All programming and source code is to be considered as a work for hire and will be the property of the Owner upon completion of the project.
 - i. Provide Owner with a full set of installation pictures of any work that is not visible, including but not limited to:
 - 1) Equipment Rack population
 - 2) Finished Ceiling population
 - 3) Wall box product population
 - 4) Large Screen Display Wall Mount
 - 5) Under Table product population
 - 6) Above Table product population
 - 7) Overall Room Perspective
2. Record Drawings
- a. Produce all Record "as-built" Drawings using the latest version of AutoCAD. Record drawings shall, at a minimum, include the following:
 - 1) Floor plan drawings indicating device locations, with device legends indicating manufacturers and model numbers for each device
 - 2) Floor plan drawings indicating wire routing, wire routing shall be delineated in straight line runs and be tagged with cable identification and terminal strip numbers to coincide with the installation
 - 3) Mounting details for all equipment and hardware
 - 4) Functional block diagrams for each subsystem
 - 5) Wiring details showing rack elevations, equipment wiring and terminations, and inter-rack wiring
 - 6) Wiring diagrams for all custom circuitry including interfaces to various control output controlled devices, lighting control interfaces, projections screens, operable window treatments, motorized doors/partitions, etc.
 - 7) Wiring diagrams for each System, wiring diagrams shall be identical to those laminated and located within the door of
 - 8) Typical point-to-point wiring diagrams for each piece of equipment and groups of equipment within the System
 - 9) Layout details for each riser location, including Audiovisual panels,

power supplies, junction boxes, conduit, and any other Audiovisual related equipment

3. Operation and Maintenance Manuals
 - a. Operation and Maintenance Manuals shall apply to all Audio Visual related devices, equipment and software modules.
 - b. Operation and Maintenance Manuals shall be formatted as follows:
 - 1) Bind each manual in a hard-back loose-leaf binder.
 - 2) Identify each manual's contents on the cover.
 - 3) Provide a table of contents and tabulated sheets for each manual. Place tab sheets at the beginning of each chapter or section and at the beginning of each appendix if applicable.
 - 4) Any hardware manual demonstrating more than one model number of device on any one page shall be clearly marked as to delineate which model has been implemented in the Work.
 - c. Operation and Maintenance Manuals shall include, at a minimum, the following:
 - 1) Operational description of each subsystem
 - 2) Detailed programming descriptions for each subsystem
 - 3) Explanations of subsystem interrelationships
 - 4) Electrical schematics for each piece of equipment specified
 - 5) Power-up and power-down procedures for each subsystem
 - 6) Description of all diagnostic procedures
 - 7) A menu tree for each subsystem
 - 8) Setup procedures for each component of the subsystems
 - 9) A list of manufacturers, their local representatives, and subcontractors that have performed Work on the Project
 - 10) Installation and service manuals for each piece of equipment
 - 11) Maintenance schedules for all installed components
 - d. Operation and Maintenance Manuals shall include a separate section for each software program incorporated into the Project. The software section shall include, at a minimum, the following information:
 - 1) Definitions of all software related terms and functions
 - 2) Description of required sequences
 - 3) Directory of all disk files
 - 4) Description of all communications protocols, including data formats, command characters, and a sample of each type of data transfer
 - 5) Instructions for manufacturer supplied report generation
 - 6) Instructions for custom report generation
 - 7) Database format and data entry requirements

F. Procedure for Resubmitting

1. Make corrections or changes in O & M and/or Record Drawings as required by the Design Professional and resubmit when the Design Professional's stamp requires re-submittal.
2. Clearly identify changes made other than those specifically requested by the Design Professional when resubmitting Record Drawings. Changes shall be clouded or similarly highlighted as coordinated with the Design Professional. Only changes that have been specifically requested by the Design Professional or have been clouded by the Contractor will be reviewed on resubmittals.
3. Any drawing sheets added to the resubmittal shall be clearly identified and clouded, and shall not change the sheet numbering scheme for previously issued

- Record Drawings.
- 4. The Contractor shall be responsible for any delays caused by the re-submittal process.
- 5. Re-submittal Review Fees
 - a. If the Design Professional rejects the Contractor's Record Submittal (Rejected, Revise, and Resubmit) more than two times, the Design Professional will be compensated for all subsequent reviews, whether partial or comprehensive. The amount of such compensation will be incorporated by Change Order and withheld from the Contractor's Application for Payment.

1.11 QUALITY ASSURANCE

A. Contractor Qualifications

- 1. Work specified herein shall be the responsibility of a single Audiovisual Systems Contractor. Submissions shall document a minimum of five (5) years experience in the fabrication, assembly, and installation of Systems of similar complexity as specified herein. The documentation shall include the names, locations, and points of contact for at least three (3) installations of the type and complexity specified herein.
- 2. Installer Training Process: – Contractor's labor force shall have certified installers who attended training programs of the proposed system preparing them to perform the work.
- 3. The Installer for this Project is to be certified by all manufacturers of the installed equipment that the Contractor proposes.
- 4. Registered and Certified supervisors- Contractor must have all supervisory personnel certified for the type of work they are overseeing (installation and design) from Avixa.
- 5. Quality assurances for audio visual systems includes a multi-step program consisting of pre-qualification procedure for manufacturers and installation specialists; product phase; installation; operating instruction and training; and the submission of maintenance and operating manuals.
- 6. The Contractor shall have local in-house engineering and project management capabilities consistent with the requirements of the Work.
- 7. By submitting an offer, the Contractor thereby certifies that it is qualified in all areas pertaining to, directly or indirectly, the Work. In the event the Contractor becomes unable to complete the Work in accordance with the Contract Documents, or the satisfaction of the Owner, it shall be the responsibility of the Contractor to retain the services of applicable manufacturers' representatives to expeditiously complete the Work in accordance with the Owner's construction schedule with no additional cost to the Owner.
- 8. The Contractor shall maintain, or establish and maintain, a fully staffed office including a service center capable of providing maintenance and service to the Project. The Contractor shall staff the service center with factory trained technicians and adequately equip the office to provide emergency service within 4 hours phone response, 24 hours on site.
- 9. The Contractor shall provide factory-certified technicians to install, commission, and maintain the Work. All installing personnel shall be licensed as required by local and/or state jurisdictions.
- 10. The Contractor shall ensure compliance with, and have a thorough understanding of, all local codes and contract conditions pertaining to this Project.

11. The Contractor shall maintain an inventory of spare parts and other items critical to System operation and as necessary to meet the emergency service requirements of this Project within the local service center.

B. Product Standards

1. All equipment and materials for contained herein shall be the products of recognized manufacturers and shall be new.
2. New equipment and materials shall:
 - a. Be Underwriters Laboratories, Inc. (U.L.) listed and approved where specifically called for; or where normally subject to such U.L. labelling and/or listing services.
 - b. Be without blemish or defect.
 - c. Be products that meet with the acceptance of the agency inspecting the Audio Visual Systems work.
3. It is the intent of these specifications that wherever a manufacturer of a product is specified, and the terms "other approved" or "approved equal" are used, the substituted item must conform in all respects to the specified item. Consideration will not be given to claims that the substituted item meets the performance requirements with lesser construction. Performance as delineated in schedules and in the specifications shall be interpreted as minimum performance.
4. Substituted equipment or optional equipment, where permitted and approved, must conform to space requirements. Any substituted equipment that cannot meet space requirements, whether approved or not, shall be replaced at the Contractor's expense. Any modifications of related Systems as a result of substitutions shall be made at the Contractor's expense.
5. The approval of shop drawings, or other information submitted in accordance with the requirements hereinbefore specified, does not ensure that the Owner attests to the dimensional accuracy, dimensional suitability of the material, or mechanical performance of equipment. Approval of shop drawings does not invalidate the Drawings and Specifications.
6. Substitutions of equipment shown on the schedules or designated by model number in the specifications will not be considered if the item is not a regular catalogued item carried by the manufacturer.
7. Within the Specifications, certain manufacturers have been listed. These manufacturers are listed for example purposes (unless followed by "No Exceptions"). The Contractor may substitute manufacturers and models that may be more cost effective or readily available than that specified. However, all substitutions shall meet or exceed the specified functional and technical requirements. Acceptance of such substitutions is at the discretion of the Owner.

1.12 WARRANTY AND MAINTENANCE

- A. Systems Contractor shall provide a three (3) year warranty for the Work. The warranty shall cover all Work, Systems, and subsystems against defects in materials and workmanship. The Work as specified herein, including all materials and labor, but excepting any existing devices and equipment which are incorporated in the completed Work, shall be warranted to be free from defects in design, workmanship, and materials. Further, the Contractor shall warrant that the completed Systems, including all components (except those, which are existing or provided by others), are of sufficient size and capacity to fulfill the requirements of the Specifications.

- B. The warranty shall be valid for a period of three (3) years following the date of System acceptance by the Owner. System acceptance shall commence when all parts, components, sub-Systems, and Systems have been tested, shown to be working in accordance with the Specification, and approved by the Owner
- C. Warranty Service:
 - 1. In the event that defects in the materials and/or workmanship are identified during the warranty period, the Contractor shall provide all labor and materials as may be required for prompt correction of the defect.
- D. Provide written notice to the Owner documenting any Work performed during the warranty period, including any preventative maintenance Work performed.
- E. Provide loaner equipment that is fully compatible with the Audiovisual Systems for any equipment not field repairable.
- F. Loaner equipment for components that must be shipped to/from the manufacturer or distributor shall be on site and operational within 48 hours of the component failure. Furnish lists of equipment that will require shipment from the manufacturer or distributor and lead times associated with that equipment.

PART 2 - PRODUCTS

2.1 WIRE AND CABLE

- A. Cable Selection: Signal type is indicated on schematic diagram at equipment input or output.

Plenum Rated / Non-Plenum Rating: Cable routed in conduits or equipment racks to have non-plenum rated (PVC) jacket. All other cables are to have plenum rated jacket. Cable is to be run continuous without splices.

- B. Cable Types:
 - 1. Microphone and Line Audio Cable:
 - a. Configuration: Non-Plenum Type CMR (CMP Plenum) – 22 AWG (.644mm) (7x30) stranded twisted shielded pair with overall shield
 - b. Properties: 17 ohms / M' with OD = 3.4 mm
 - 2. Low Impedance Loudspeaker Cable:
 - a. Configuration: Type CL3 – 12 AWG (2mm) (19x25) stranded twisted pair (size based on length of run)
 - b. Properties: 1.7 ohms / M' with OD = 6.8 mm
 - 3. High Impedance Loudspeaker Cable (25V / 70V)
 - a. Configuration: Type CMR – 18 AWG (1 mm), (7x26) stranded pair (size based on length of run)
 - b. Properties: 6.2 ohms / M' with OD = 4 mm
 - 4. Wireless Microphone Antenna Cables within equipment racks
 - a. Configuration: Type CM 50 ohm RG-58/U 22 AWG (.644mm) solid center conductor.
 - b. Properties: OD = 5 mm
 - 5. Wireless Microphone and Hearing Assistance Antenna Cables outside of equipment racks

- a. Configuration: Type CM 50 ohm RG-8/U 11 AWG (2.3 mm), (7x19) center conductor
 - b. Properties: OD = 10.2 mm
 6. Video Tie Line Cable:
 - a. Configuration: Type CM RG6/U coaxial cable 18 AWG (1.02 mm) solid bare copper
 - b. Properties: 2.5 dB attenuation at 10Mhz per 100 m with OD = 6.42 mm
 7. Video Tie Line Cable baseband five (5) conductor:
 - a. Configuration: Type CM RG6/U coaxial cable 18 AWG (1.02 mm) solid bare copper
 - b. Properties: 15 dB attenuation at 400 MHz per 100 m with OD = 10.2 mm
 8. Digital Video/Audio (unbalanced) Tie Line Cable one (1) conductor:
 - a. Configuration: Type CMR RG6/U coaxial cable 18 AWG (1.02mm) solid bare copper
 - b. Properties: 35 dB attenuation at 3 GHz per 100 m with OD= 6.9 mm
 9. Digital Video UTP Tie Line Cable
 - a. Configuration: Type CMR Category 6, 4 pair, 24 AWG (.5mm)
 - b. Properties: 30.5 dB attenuation at 250 MHz per 100 m with OD = 5.8 mm
 - c. Controlled media twist, where applicable
 10. Data Tie Line Cable:
 - a. Configuration: Type CMR Category 6, 4 pair, 24 AWG (.5mm)
 - b. Properties: 30.5 dB attenuation at 250 MHz per 100 m with OD = 5.8 mm
 11. RS-232 Control Cable
 - a. Configuration: Type CL3R, Two Pair twisted shielded with overall shield, 22 AWG (.644 mm), (7x30)
 - b. Properties: 55 pf/ft with OD = 5 mm
 12. Specialty Control Cable:
 - a. Control and communication cable as required for DSP configuration to be verified and included.
- C. Manufacturers:
1. Belden
 2. West Penn
 3. Commscope
 4. Substitution: By approved substitution means.

PART 3 - EXECUTION

3.1 EXAMINATION

- D. Verification of Conditions: Examine the areas to receive the work and the conditions under which the Work would be performed. Contractor shall remedy conditions detrimental to the proper and timely completion of the Work. Do not proceed until unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. General

1. Installation shall include the delivery to the installation site, unloading, setting in place, fastening to walls, floors, ceilings, counters, or other structures where required, interconnecting wiring of the system components, equipment alignment

and adjustment, and all other work whether or not expressly required herein which is necessary to result in complete and fully operational systems.

2. Prior to ordering equipment, the contractor shall coordinate the frequencies of all wireless devices to prevent unwanted interaction between devices and rooms. This includes, but is not limited to, wireless microphones, assisted listening system devices, wireless control panels, etc.
3. All accessories, including rack mounting hardware, power supplies, etc., shall be obtained from the original equipment manufacturer. Unless otherwise noted or specified, third party accessories shall not be used.
4. All installation practices shall be in accordance with, but not limited to, these specifications and drawings. Installation shall be performed in accordance with the applicable standards, requirements, and recommendations of National and Local authorities having jurisdiction.
5. If, in the opinion of the Contractor, an installation practice is desired or required, which is contrary to these specifications or drawings, a written request for modification shall be made to the Owner. Modifications shall not commence without written approval from the Owner. Every effort will be made to respond to all written requests, in a timely manner, as to not delay the installation or completion of the project.
6. During the installation, and up to the date of final acceptance, the Contractor shall be under obligation to protect his finished and unfinished work against damage and loss. In the event of such damage or loss, the damage shall be replaced or repaired at no cost to the Owner.

B. Physical Installation

1. All equipment shall be firmly secured in place unless requirements of portability dictate otherwise.
2. All equipment shall have an engraved plaque permanently affixed, denoting its function.
3. Fastenings and supports shall be adequate to support their loads with a safety factor of at least three. All boxes, equipment, etc., shall be secured plumb and square.
4. In the installation of equipment and cable, consideration shall be given not only to operational efficiency, but also to overall aesthetic factors.
5. Where audio visual devices are attached to a wall, ADA requirements will be adhered to for height and protrusion from wall.
6. Trim and Escutcheon Components
 - a. To insure a proper finished appearance, the AV Contractor shall furnish and install trim/escutcheon components at all conditions where A/V components pass through the finished ceilings. This would include but not be limited to video projector supports, flat-panel display supports and any other component which is not specifically supplied with integral flanges/trim components; i.e. speaker mounts, assistance listening devices, etc.
 - b. All trim components at the ceiling plane shall be finished to match the approved ACT ceiling grid system components. The audiovisual contractor should obtain a sample from the General Contractor, including any custom color information, or standard color numbers. All trim components shall be submitted to the Design Professional for review and approval prior to fabrication.

C. Cable Installation

1. All wire bundles are to be neat and combed free of cable crossovers.
2. All cables, regardless of length, shall be marked with a permanent, self-laminating wrap-around number or letter cable marker at both ends. Labels must be computer-generated for legibility. Wire labels done by hand in the field must be replaced with computer generated labels. There shall be no unmarked cables at any place in the system. Marking codes used on cables shall correspond to codes shown on drawings and or run sheets.
3. All cables shall be grouped according to the signals being carried. In order to reduce signal contamination, separate groups shall be formed for the following cable families:
 - a. Power cables
 - b. Control cables
 - c. Video cables
 - d. Audio cables carrying signals less than – 20 dBm
 - e. Audio cables carrying signals between – 20 dBm and +20 dBm
 - f. Audio cables carrying signals above +20 dBm
4. As a general practice, all power cables, control cables, and high level cables shall be run on the left side of an equipment rack as viewed from the rear. All other cables shall be run on the right side of an equipment rack, as viewed from the rear.
5. Cables ties shall be placed at appropriate intervals of no greater than six inches for vertical bundles, two inches for horizontal bundles.
6. All vertical cable bundles shall be attached to the rack frame.
7. All cables shall be continuous lengths without splices. All system wire, after being cut and stripped, shall have the wire strands twisted back to their original lay and be terminated by approved soldered or mechanical means. Except where noted otherwise in the specifications, NO BARE WIRE TERMINATIONS WILL BE ACCEPTED. Heat-shrink tubing shall be used to insulate the ground or drain wire. Unused wires at the end of a cable shall remain unstripped and shall be laid back and held in place with wire ties.
8. All solder connections shall be made with rosin-core solder using temperature-controlled solder stations. Care shall be taken to avoid cold or cracked solder joints. Any connections that do not appear to be clean and shiny, or which show signs of cracking, shall be re-soldered by the contractor before final acceptance of the system.
9. Mechanical connections using insulated, crimp-type connectors shall be bonded to the connector by soldering the wire to the metal part of the connector.
10. Connections made with screw actuated pressure type terminal strips shall be made by stripping approximately 1/4 inch of insulation from the stranded conductor. Then the un-tinned wire shall be inserted into the terminal and the screw tightened using a secure fitting precision screwdriver.
11. Terminal blocks, boards, strips or connectors shall be furnished for all cables which interface with racks, cabinets, consoles, or equipment modules. No audio cables shall run directly to the audio patch panel jacks. Each audio patch panel shall be furnished with an audio terminal- block and all audio cables to and from the audio patch panel shall terminate on this block.
12. All wire markers shall face a common direction.
13. All cables shall have proper connector housing.
14. Cables shall not protrude from the back of racks.
15. All cable entry shall be through the tops of racks or through entrance holes in the base of the rack. No cable shall enter racks through front, rear or side panel openings.

16. Refer to PART II for cable types and specifications. However, general guidelines for signal type to cable model matching are included below:
 - a. Type Non-Plenum Plenum
 - b. Video (Baseband & SDI) Belden 1505A 1506A
 - c. S-Video Belden 1807A 7700A
 - d. Control (4 conductor shielded) Belden 1502R 1502P
 - e. Control (12 conductor shielded) Belden 9556 6309FE
 - f. Audio Belden 9451/1266A
 - g. Audio (8 ohm program speakers) Belden 8473 1861A
 - h. Audio (70 Volt Speaker) Belden 8461 1863A
 - i. Video, RGB (RG6) Belden 7712A None
 - j. Video, RGB (RG59) Belden 7796A 1826A
 - k. Multi-channel Audio Belden 8774 88778
 - l. Digital Audio (110 Ohm) Belden 1800B 1801B

Note: These cable types are cited to illustrate the type and quality of cable required. Unless otherwise noted, cables from other manufacturers, i.e. Canare, CommScope, Extron, Liberty, etc. will be considered acceptable if data sheets are submitted prior to installation.

17. Unless otherwise noted, all analog video and computer video cables are to be terminated using seventy-five ohm (75 Ohm) connectors, with a captive center pin.
 18. Cables running in plenum areas without conduit shall be plenum rated cable, and match the specified cable above. It is the responsibility of the offerer to inspect the electrical drawings, and verify in what spaces plenum cable shall be used. No claims for additional monies, based on the use of plenum cable, will be allowed.
 19. All cables (except video and pulse cables, which must be cut to an electrical length) shall be cut to the length dictated by the run. No splices shall be permitted in any pull boxes without prior permission of the Owner. For equipment mounted in drawers or on slides, the interconnecting cables shall be provided with a service loop of appropriate length.
 20. No cable shall be installed with a bend radius less than that recommended by the cable manufacturer.
 21. Where cables are installed in architectural niches, ensure that the cables are black, unless otherwise directed, to reduce visibility from the audience.
 22. Where cables are installed that are visible, the cables will be sheathed in a color wrap that has been pre-approved for the location.
 23. Contractor to provide all appropriate patch cables where necessary for use from connection plates to equipment. Network patch cables will be minimum CAT6.
- D. Connection Plate Receptacles
1. Audio (microphone) – XLR type.
 2. Audio (line level) – ¼ inch diameter tip/ring/sleeve type, or as required by the intercom system. Jack shall be insulated from panel type.
 3. Audio (loudspeaker level) – Neutrik “Speak-On” Type.
 4. Audio (computer) 1/8 inch diameter tip/sleeve
 5. Video – BNC type.
 6. VGA – DB15HD Female
 7. DVI – DVI-I jack, isolated from panel type, with hex nuts.
 8. HDMI – HDMI type A
 9. RF – “F” type. Receptacles shall be insulated from panel type.
 10. Category 5/6 - RJ45 type
 11. USB – USB Type A

12. Note: All connectors on wall plates, or in other exposed locations, are to be recessed.

E. Grounding Procedures

1. In order to minimize problems resulting from improper grounding, and to achieve maximum signal-to-noise ratios, the following grounding procedures shall be adhered to:
 - a. System Grounds: A single primary "system ground" shall be established for the systems in each particular area. All grounding conductors in that area shall connect to this primary system ground. See the perimeter grounding conductor installed under the base construction contract.
 - 1) The system ground shall be provided in the audio equipment rack for the area, and shall consist of a copper bar of sufficient size to accommodate all secondary ground conductors. A copper conductor having a maximum of 0.1 Ohms total resistance shall connect the primary system ground bar to the nearest approved electrical ground. The Contractor shall be responsible for determining if the metallic conduit is properly electrically bonded to the building ground system.
 - 2) Secondary system grounding conductors shall be provided from all racks, audio consoles, and grounding points for the area. Each of these grounding conductors shall have a maximum of 0.1 Ohms total resistance.
 - 3) Under no conditions shall the AC neutral conductor, either in the power panel or in a receptacle outlet, be used for a system ground, except as specifically defined by NFPA for bonding.
 - b. Audio Cable Shields
 - 1) All audio cable shields shall be grounded at one point only. There are no exceptions. For inter and intra-rack wiring, this requires that the shield be connected at one end only. For ungrounded portable equipment, such as microphones, the shield shall be connected at both ends but grounded at only one end.
 - c. Video Receptacles
 - 1) All video receptacles that are provided and installed by the Contractor shall be insulated from the mounting panel, outlet box, or wireway. Unless otherwise detailed herein, this shall be accomplished by using insulated-from-panel type receptacles.
 - d. Audio Receptacles
 - 1) All audio receptacles that are provided and installed by the Contractor shall be insulated from the mounting panel, outlet box, or wireway. Unless otherwise detailed herein, this shall be accomplished by using insulated-from-panel type receptacles.
 - e. General
 - 1) Because of the great number of possible variations in grounding systems, it shall be the responsibility of the Contractor to follow good engineering practice, as outlined above, and to deviate from these practices only when necessary to minimize crosstalk and to maximize signal-to-noise ratios in the audio, video, and control systems.

3.3 PERFORMANCE STANDARDS

- A. Unless restricted by the published specifications of a particular piece of equipment, or unless otherwise required under the Detailed Specifications, the following performance standards shall be met by each system. The signal paths for the Performance Standards shall be as follows: From all source inputs to all signal destinations. See Contractor

System Checkout Section for testing procedures.

1. Analog Audio
 - a. Frequency Response - plus or minus 0.5dB, 20- 20,000 Hz.
 - b. Signal-to-Noise Ratio -greater than 90dB (including crosstalk and hum at all input/output levels)
 - c. Total Harmonic Distortion - 0.05% max. from 20- 20,000 Hz.
 - d. Input Levels
 - 1) Microphone (Nominal): -50dbu
 - a) Overload (Minimum gain) : -5dbu
 - b) Maximum Gain: -26dbu
 - 2) Line (Nominal): +4dbu
 - a) Overload (Minimum gain):+24bu
 - b) Maximum Gain: +9dbu
 - e. Output Levels
 - 1) Line (Nominal): +4dbu
 - 2) Maximum: +24dbu
 - 3) Output Impedance: <0.5 Ohms
 - 4) Load Impedance: >150 Ohms
2. Analog Video (signal)
 - a. Frequency Response - plus or minus 0.5dB, DC to 4.2 MHz
 - b. Signal to Noise Ratio: 55 dB minimum. (Peak to RMS) unweighted, DC to 4.2 MHz
 - c. Crosstalk: 45 dB minimum unweighted DC to 4.2 MHz
 - d. Line and Field Tilt: 2% maximum
 - e. Differential Gain: 3% maximum
- B. Optical projection systems shall meet the following performance standards:
 1. The total averaged light output from a projector, in lumens, shall be within plus-or-minus 15% of that specified by the projector manufacturer.
 2. The light fall-off from the center of the projected image to all four corners, as measured at the projected image plane, shall not exceed 35% for projector images. The light intensity shall be measured at all five positions of the projected image after the projector has been adjusted to provide the light output as specified above.
 3. The light meter used for the above measurements shall be a properly calibrated foot-candle (or lux) meter and shall be cosine-corrected.
 4. Projectors, lenses, and mirrors shall be solidly mounted and braced, so that there will be no observable movement in the image induced by motor vibration or other mechanical operations.
- C. Control System User Interface
 1. Control system user interfaces pages shall be designed for this project exclusively.
 - a. While there are a great number of design approaches to designing the user interface, the following guidelines shall be adhered to:
 - b. All panels are to have the time and date as icons, in the same position on every page.
 - c. All panels are to have a title, indicating the piece of equipment and/or functionality being controlled.
 - d. Each individual room type shall be given the same user interface design and layout, throughout the entire campus, to the greatest extent possible.
 - e. User interface design, shall, to the greatest extent possible – taking into account the variations in system functionality from room type to room type, maintain continuity throughout the campus.

2. Final programming shall include capability to remotely control all functions of the Audio system. Individual device controls shall provide full manufacturer's functionality.
3. Devices similar in nature shall be programmed to operate with a common format.
4. No individual component shall be programmed to function atypically.
5. Whenever the same button appears on more than one page, it will be in the same position on each page.
6. Functions used during a general presentation shall be accessible with a minimal amount of button presses/page flips.
7. Where feasible, multi-level access to controls should be implemented.
8. During performance testing, all equipment shall be operated under standard conditions as recommended by the manufacturer.

3.4 CONTRACTOR SYSTEM CHECKOUT

- A. Before Acceptance Tests are scheduled, the Contractor shall perform his own system check-out. He shall furnish all required test equipment and shall perform all work necessary to determine and/or modify the performance of the system to meet the requirements of this specification. This work shall include the following:

1. Test all audio systems for compliance with the Performance Standards, using the following test procedure:
 - a. Test Equipment: Assemble the following test equipment (or equivalent) on site.
 - 1) Audio check:
 - a) Signal generator
 - b) Audio test via portable device
 - c) Computer audio output
 - d) Audio cables
 - 2) Video checks:
 - a) Video signal generator, Extron
 - b) DVI signal generator, Sencore 403C-SH
 - c) HDMI and VGA computer output
 - d) Test patterns
 - 3) Gain Setting
 - a) Adjust all systems (starting at source equipment and terminating at the power amplifiers) for maximum gain and minimum distortion.
2. Signal Paths
 - a. Video/Audio
 - 1) Connect the output of the video signal generator to a floor box/table/rack connector and select the "Full Field Color Bar" signal.
 - 2) Measure and record the signal amplitudes.
 - 3) Repeat item '1' after selecting the "Multiburst, 50 IRE" test signal.
 - 4) Measure and record the signal amplitudes.
 - 5) Repeat item '1' after selecting the "Modulated 5-step" test signal.
 - 6) Measure and record the signal differential phase and gain.
 - 7) Repeat item #'s '1' through '6' for other video signal paths.
 - 8) Repeat item '1' after selecting the Window test signal.
 - 9) Measure and record the signal line and field tilt.
 - 10) Repeat item '1' after connecting the Black Burst signal from a rear mounted connector.
 - 11) Measure and record the signal/noise ratio.

- 12) Connect the output of the audio test set to a floor box/table/rack program audio connector and connect the input of the audio test set to a final output point, e.g. an input to a program speaker power amplifier. Ensure that the test signal is routed to the selected output, that the volume control is set to 100% and that the equalizers are bypassed.
- 13) Measure and record the signal/noise ratio, total harmonic distortion and frequency response.
- 14) Repeat items '12' and '13' for other audio signal paths.
- 15) Connect the output of the audio test set to a floor box/table/rack speech audio connector and connect the input of the audio test set to a final output point, e.g. an input to a speech speaker power amplifier. Ensure that the test signal is routed to the selected output, that the volume control is set to 100% and that the equalizer is bypassed.
- 16) Measure and record the signal/noise ratio, total harmonic distortion and frequency response.
- 17) Repeat items '15' and '16' for other audio signal paths.
- 18) DVI: Connect the DVI output of the signal generator to a floorbox/table/rack connector and select the SMPTE & PLUGE signal at the various computer scan rates as follows:
 - a) 640 x 480 31.5 kHz H, 60 Hz V
 - b) 640 x 480 37.5 kHz H, 75 Hz V
 - c) 800 x 600 38 kHz H, 60 Hz V
 - d) 832 x 624 49.7 kHz H, 75 Hz V
 - e) 1024 x 768 48 kHz H, 60 Hz V
 - f) 1280 x 768 48 kHz H, 60 Hz V
 - g) 1366 x 768 47.8 kHz H, 60 Hz V
 - h) 1280 x 1024 64 kHz H, 60 Hz V
 - i) 1400 x 1050 63.9 kHz H, 60 Hz V
 - j) HD 720p 45 kHz H, 60 Hz V
 - k) HD 1080i 33.75 kHz H, 30/60 Hz V
 - l) HD 1080p 33.75 kHz H, 30/60 Hz V
- 19) Check that the image is correctly displayed on the picture monitor(s) and/or by the video projector.
- 20) Repeat item '2' using Crosshatch signal, checkerboard signal and H Pattern signal.
- 21) Repeat item '2' for other DVI connection locations.
- 22) Connect the output of the audio signal generator to a floorbox/table/rack 'Left' and 'Right' connectors and select the 1 kHz tone. Check that the signal is emitted from the left and right program speakers.
- 23) Repeat item 'v' for other audio connection location.
- 24) Note: Whenever possible, include computer sources provided by the Owner, at the desired resolution, in your testing.
- b. At the conclusion of the tests, return all equipment settings to previously calibrated positions.
- c. Provide written records of all test results in spreadsheet form.
- d. Check all control functions, from all controlling devices to all controlled devices, for proper operations.
- e. Adjust, balance, and align all equipment for optimum quality and to meet the manufacturer's published specifications. Establish and mark normal settings

for all level controls and record these settings in the "System Operation and Maintenance Manual".

- f. Check all optical projection images for average light level, light fall-off, and image alignment and size to comply with the Performance Standards and specifications drawings. Check to determine that all projectors, projector bases, carts, tables, and mirrors are rigid and vibration-less in operation.
- g. Maintain documentation of all performance tests for reference by the Owner during the System Acceptance Tests.

3.5 SYSTEM ACCEPTANCE TESTS

- A. System Acceptance Tests will not be performed until the Contractor's System Checkout has been completed and the test results have been reviewed. The System Acceptance Tests will be supervised by the Owner and will consist of the following:
 - 1. A physical inventory will be taken of all equipment on site and will be compared to equipment lists in the contract documents.
 - 2. The operation of all system equipment shall be demonstrated by the Contractor.
 - 3. Both subjective and objective tests will be required by the Owner to determine compliance with the specifications. The Contractor shall be responsible for providing test equipment for these tests.
 - 4. All final, "as-built" drawings, run sheets, manuals, and other required documents, as detailed in Part I, shall be on hand. Two complete sets of these documents shall be delivered to the Owner at this time

3.6 SYSTEM TRAINING

- A. System Training will be performed by the Contractor after the systems have been fully completed and tested by the Contractor. The Owner will determine the number of personnel to participate in the training. The System Training will consist of up to 40 hours of training.

END OF SECTION

SECTION 27 41 16
AUDIOVISUAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Refer to the following Sections for specifications related to the Work:

1. Section 27 41 00 Audiovisual General Conditions

1.2 SUBMITTALS

- A. Provide in accordance with Section 27 41 00, General Conditions and Requirements for Audiovisual Systems

1.3 INSTALLATION, COMMISSIONING, TESTING, DELIVERY

- A. Provide in accordance with Section 27 41 00, General Conditions and Requirements for Audiovisual Systems

PART 2 - PRODUCTS

2.1 GENERAL NOTES - AUDIOVISUAL PRODUCTS

- A. Shall operate on 120 to 240VAC at 50/60 Hz as appropriate.
- B. Shall be capable of operating continuously for 12 hours over the external ambient temperature range of +10°C to +65°C (20% to 95% humidity, non-condensing) without permanent damage.
- C. All programmed software-based, microprocessor-based control and DSP devices shall be powered by a UPS supply capable of providing 10 minimum minutes backup time.
- D. RJ-45 UTP Cabling shall be terminated via punch down method only as compliant to EIA / TIA telecommunications standards. No field terminated RJ-45 cable ends shall be accepted.
- E. See section 27 41 00 – General Conditions and Requirements of Audiovisual systems for wire and cable requirements.

2.2 Applicable Locations and Descriptions:

- A. Public Lobby / Screening 102A, 103:
1. This location includes three (3) 65" wall-mounted Interactive displays in portrait mode. These displays can show Docket information, wayfinding signage or instructions on the process of getting through screening.
 2. The AVSI is responsible for the display, the mount and the Small form-factor PC (SFPC).
 3. Configuration of the PC, the signage platform, platform management and content are provided by the Owner.

B. Large Interview/Meeting Room – 109:

1. This location includes a 65" wall-mount flat panel display.
2. An all-in-one conferencing system (camera, mic array, integrated speakers) is to be mounted below the display.
3. A small form factor PC is to be mounted on the underside of the table and provided with a wireless keyboard and mouse. The PC connects to an extender box which connects through the floor box below the desk via CAT6 cabling. The receiver for the extender is hidden behind the display and connects to the conferencing soundbar unit below the display. The Network connectivity for the VTC (which connects to the site LAN) is by the Telecom Contractor.
4. Sound support is via the integrated speakers of the VTC unit and the display.
5. Control is via a control panel located on the top of the conference room table to the floor box below. The control panel cabling will extend through a grommeted opening in the surface of the table provided by the table manufacturer and connects to the floor box below and to the control processor behind the display.

C. Medium Conference Rooms 110, 208, 236, 316:

1. This location includes a 75" wall-mount flat panel display.
2. An all-in-one conferencing system (camera, mic array, integrated speakers) is to be mounted below the display.
3. A small form-factor PC is to be provided with a wireless mouse and keyboard and mounted below the table and connected to an HDMI and USB transmitter/Extender. The transmitter (located on the underside of the table, converts the image to HDBT for transport via twisted pair cabling to the receiver which resides behind the display and is connected to the all-in-one conferencing soundbar
4. The Network connectivity for the PC (which connects to the site LAN) is by the Telecom Contractor.
5. Sound support is via the integrated speakers of the soundbar unit and the display.
6. Control is via a control panel located on the top of the conference room table to the floor box below. The control panel cabling will extend through a grommeted opening in the surface of the table provided by the table manufacturer and connects to the floor box below and to the control processor behind the display.

D. Large Conference Room 258:

1. This location includes an 85" wall-mount display.
2. An all-in-one conferencing system (camera, mic array, integrated speakers) is to be mounted below the display.
3. A small form-factor PC is to be hidden in the credenza below the display and provided with a wireless mouse. The SFPC is connected to the all-in-one VTC system directly above.
4. Wireless share is also provided in this space. The device is hidden in the lectern or at the display.
5. The Network connectivity for the VTC (which connects to the site LAN) is by the Telecom Contractor.
6. Ceiling-mounted microphones will capture the attendees during the

conference call. These microphones are not used for voice lift inside the conference room.

7. Sound support is via the integrated speakers of the VTC unit and the ceiling-mounted loudspeakers.
8. Control for the AV System and display (On/Off, source routing and program volume) is via a tabletop control panel which connects through a grommeted opening in the table to the floor box below and to the VLAN switch for the control processor located in the credenza.
9. The conferencing interface is via the control pad of the Conferencing system.

E. Seminar/Shared Classroom (Divisible space) 207:

1. Displays:
 - a. The North wall includes four (4) 98" High-resolution displays. This provides two (2) for each room when separated, and four (4) total when the rooms are combined.
2. Sources:
 - a. Source connectivity is via four (4) wall plate AVIP Encoder locations. Two are via floor boxes adjacent to the North wall and two are on the South wall (technician locations). Each wall plate will accommodate HDMI connectivity.
 - b. There are additional locations in the room where dual network drops are provided (Tenant, Site). If the technician is sitting in these locations, they will utilize wireless communications for input source provision.
 - c. When the rooms are separated, the two plates in that half of the room can be utilized for the displays. When the rooms are combined, any of the input plates can be shown on any, or all of the displays.
 - d. Lecterns will be utilized over the floor boxes. Wireless share devices will be used for these locations. The wireless source is converted into AVIP for routing to any or all of the displays. The wireless share device can be hidden at the display or in the lectern (if the lectern is static).
 - e. The displays each have a AVIP Decoder which converts the signal back into what is required by the displays.
 - f. County is to notify SM&W if a resident PC is required in this room and where it is to be located.
 - g. Camera, Video Capture - There are two (2) wall-mounted cameras in this space on the South wall. Video, control and power are run remotely through the extension system. This camera image is converted into USB for transport into a laptop utilized for Zoom communications (location TBA clarified by County).
3. Audio - Voice Lift in this space is varied by location:
 - a. Two channels of wireless microphones are provided in each room. One handheld and one belt pack/Lavalier will be included with each system.
 - b. When the rooms are separated only two (2) channels are available to each room. When the room is combined, four (4) channels are available to the presenters.
 - c. The Lectern will include a gooseneck stand with clip to allow the wireless handheld mic to be utilized in this location.
 - d. Two separate channels of Assistive Listening system are provided for this space. Each pkg includes the transceiver and four (4) beltpack receivers with headset, two (2) neck loops, signage, rack kit, and cabling. This will

- operate in a similar manner as when the room is combined. The county will change all receivers to one of the channels (AVSI to designate) which will be transmitting all audio to these devices for the hearing impaired via routing in the DSP.
- e. Ceiling microphones are provided for capturing the audio from the audience. These mics are not used for voice-lift.
4. Control:
- a. Control of the display's On/Off, routing of the sources to be viewed on either displays, and program volume control is via 10" touch sensitive control panels on the North wall behind the lectern.
 - b. A virtual Touch panel control is to be provided for this space for times when the technician is in the back of the room. A 10.5" iPad is to be configured for this space with the Crestron Xpanel application and utilizing the site LAN for communications.
 - c. Each of the cameras will have three Presets programmed into the control panel (and Xpanel) to allow for quick selection of static views (medium shot of lectern, wide shot of front of room which includes the closest display, wide shot of front of room, both displays). The ability to put the camera in automatic tracking mode will be via a password-protected tech page.
 - d. Control of the audio volumes will be automatically done with the DSP. The ability to go into manual mode will be via the password-protected tech page. When the system is powered down, it will resort back to the default power up status of automatic volume control.
5. Equipment is to be housed in an AV rack located the AV Tech room 214.
- F. Chief Justice's Conference Room 332:
- 1. This location includes a 75" wall-mount flat panel display.
 - 2. An all-in-one conferencing system (camera, mic array, integrated speakers) is to be mounted below the display.
 - 3. A small form-factor PC is to be provided with a wireless mouse and keyboard and mounted below the table and connected to an HDMI and USB transmitter/Extender. The receiver for the extender resides behind the display and is connected to the all-in-one conferencing soundbar
 - 4. The Network connectivity for the VTC (which connects to the site LAN) is by the Telecom Contractor. The receiver is hidden behind the display
 - 5. Sound support is via the integrated speakers of the VTC unit and the display.
 - 6. Control is via a tabletop control panel on the conference table. The cabling extends to the floor box below and to the control processor at the display.
- G. Courtroom 340:
- 1. Displays:
 - a. This inside of the courtroom will include: two (2) 24" Touch Sensitive desktop displays (Witness and Lectern), three (3) 13" touch sensitive desktop display (2 at Clerk, 1 at Court reporter) and seven (7) non-touch sensitive 24" desktop displays (Judge and Attorneys). Each 24" display (regardless of surface) is mounted on an Ergotron monitor stand for stability.
 - b. Four (4) 85" Wall mount displays inside the courtroom provides playback of content from the AV input plates or State laptop.
 - c. A rack mount display will show the camera matrix preview image to verify

- accuracy of the image being distributed.
2. Sources:
 - a. The sources for the displays are: the State laptop, or via input connectivity at the Lectern and each of the four (4) attorney's tables. These locations utilize a tabletop cable cubby which extends cables to the Encoder below the table and provides cable management for other tabletop elements that are not extended through a grommited opening in the table. The AVIP encoder extends to the floor box for connections to the VLAN switch in the AV rack for that courtroom.
 - b. The Lectern system allows for annotation via the touch surface of the display and an annotation processor hidden in the lectern. The converter receiver is in the AV Rack.
 - c. The AVIP Decoders are located at the displays (behind the display or mounted on the underside of the table or dais) to convert the signal back to HDMI for input into the displays.
 - d. A wireless presentation device is also accessible to the court (hidden in the lectern) for wireless presenting without cables.
 - e. Annotation over the image is also available at the Witness box. Annotation is via the display and processors hidden in the Dais.
 - f. A document camera is provided to be utilized via connectivity in the lectern or from one of the Attorney's tables.
 - g. A Blu-ray/DVD/CD player is located in the rack for playback of content using this type of media.
 3. Audio - Voice Lift in this space is varied by location:
 - a. The Judge utilizes a tabletop boundary mic for capture of conversations at the dais.
 - b. The Witness utilizes a 16" gooseneck mic with integrated speaker.
 - c. Each Attorney's table has one (1) 24" gooseneck mic with integrated speaker.
 - d. The lectern utilizes a 24" gooseneck mic with integrated speaker.
 - e. The Clerk utilizes a 24" gooseneck mic with integrated speaker.
 - f. A wireless Handheld Mic on a tall, disc-based mic stand provides an additional location for persons to present and be heard from the center area between the Judge's bench and the attorney's tables.
 - g. Sound support for the area is via the integrated speakers of the microphones and via the wall mounted loudspeakers near the gallery.
 - h. An Assistive Listening system is provided. It will allow point-to-point communications and interpretation without requiring a separate transceiver in the courtroom.
 4. Recording - Clerk recording and documentation platform, For the Record (FTR) Recording Suite, is being utilized in this space. This Suite package should also include the external Clock which connects to the recording PC and is located at the Clerk or Judge's position.
 - a. The Audio Recording/Documentation Small Form-factor PC is to be provided by the AV contractor and located at the Clerk's desk. Content for the multi-channel audio recording at the PC and the "State Laptop" is derived from AVB connectivity from the DSP and via USB converters and extenders.
 - b. Zoom Calls and content sharing in the courtroom is via the "State Laptop" connections at the Clerks desk. The AVSI is to provide cabling between the encoder, USB extender and site LAN connections.

- c. Camera, Video Capture - There are four (4) cameras in this courtroom. Three are wall mount (CAM2) and one is ceiling mounted (CAM3). Video, control and power run remotely through the extension system. The camera images can be viewed as single image, dual image, or combined as a 4-quadrant image with the image processor. Whichever sources are selected to view, the processor will automatically provide a combined image for that quantity. This multi-image is converted into USB for transport into the laptop utilized for Zoom communications and recording. This OFE laptop is not the same one utilized for FTR recordings and is located at the Clerk position.
- 5. Control:
 - a. Control of the displays On/Off, routing of the sources to be viewed on either displays, and Program volume control is via 10" touch sensitive control panels at the Judge and at the Clerk.
 - b. The cameras do not need multiple presets programmed into the control panel. Changes to the view will be accomplished with the handheld remote which is included with the camera.
 - c. Control of the quad/single/dual camera image for distribution or recording is via the control panel at the Clerk and Judge.
 - d. Control of the routing for annotation or recording is via the Clerk or Judge's touch panel.
 - e. Control of the For the Record PCs or sources is via the FTP platform in the Clerk's PC.
 - f. Control of the dialing interface for the VOIP connection to the DSP is via the control panel at the clerk's desk.
 - g. Control of the document camera is manually at the lectern or attorney's tables.
 - h. Control of the Blu-Ray/DVD/CD player (Play, stop, pause, rewind, forward) is via the control panels at the Clerk and Judge.

PART 3 - EXECUTION

1.1 INSTALLATION

- A. Adhere to Section 27 41 00 – General Conditions and Requirements of Audiovisual Systems
- B. Audio Visual Systems Integrator (AVSI) is to provide credentials and certifications for brands utilized in this project with their bid documents.
- C. All audiovisual cabling shall pass through walls via properly installed conduit sleeves. Any damage to above-ceiling drywall shall be repaired and firestop sealed per building regulations.

1.2 MOUNTING HEIGHTS/LOCATIONS

- A. Section 27 41 00 – General Conditions and Requirements of Audiovisual systems
- B. Coordinate locations of the following with mounting heights as indicated on drawings:
 - 1. Technical wall plates
 - 2. AV input/output connections

3. Video projector connections
4. Control panels
5. Pull boxes

- C. Install all technical panels plumb.
- D. Install equipment racks in location shown on drawings
- E. Arrange for adequate ventilation and access.

1.3 CABLE SUPPORT

- A. Supporting method in accordance with Section 26 0500
- B. Section 27 41 00 – General Conditions and Requirements of Audiovisual systems
 1. Individual runs throughout building – Support from building structure with approved hanger assemblies. Cables on top of ceiling tiles will be rejected. Cable supported by ceiling grid support wires will be rejected.
 2. Cable Bundles – Provide additional support as needed for larger bundles

1.4 CABLE SEPARATION

- A. Section 27 41 00 – General Conditions and Requirements of Audiovisual systems
- B. Cable separation of cables for runs greater than 25ft:
 1. Microphone Level – 1ft from all other circuits.
 2. Line Level and Control – 1ft from any circuit with signal of 20dB or greater than Line Level and Control cables.
 3. Speaker level circuits – 1ft from other circuits.
 4. Video and Data – 1ft from any circuit with signal of 20dB or greater than Video and Data.
 5. AC Power Circuits – 1ft from all other circuits.

1.5 RACK CABLING

- A. Section 27 41 00 – General Conditions and Requirements of Audiovisual systems
 1. Neatly train and lace cables.
 2. Route cables from components to lacing bars installed on rear rack rail.
 3. Provide service loops for each cable.
 4. Cable separation for runs within equipment rack:
 - a. Microphone Level – 2" from all other circuits.
 - b. Line Level and Control – 2" from any circuit with signal of 20dB or greater than Line Level and Control cables.
 - c. Speaker level circuits – 2" from other circuits.
 - d. Video and Data – 2" from any circuit with signal of 20dB or greater than Video and Data.
 - e. AC Power Circuits – 2" from all other circuits.

1.6 APPROVED WIRE TERMINATION MEANS

- A. Section 27 41 00 – General Conditions and Requirements of Audiovisual systems
 1. Solder Connections – For connectors utilizing Solder Cups

2. Terminal strip connectors – For termination of blunt cut cables, cable to be tinned prior to termination
3. Multi-Pin connectors – Utilize connector manufacturers crimper
4. Crimp Cap Terminations – For Loudspeaker circuits at individual devices.
Distribution cable termination to utilize terminal strip connectors.

1.7 CONTRACTOR'S FINAL CHECKOUT

- A. Section 27 41 16 – General Conditions and Requirements of Audiovisual Systems.

END OF SECTION

NOT FOR BIDDING PURPOSES

Customer: Castle County Courts
AV Package : Bid Pack 5
AV Bid:
Date On sheet: July 3, 2026

NUMBER	SPACE
1	Lobby & Screening (102A, 103)
2	Large Interview / Meeting Room (109)
3	Medium Conference Rooms (110, 208, 236, 316)
4	Large Conference Room (258)
5	Seminar / Shared Classroom (207)
6	Chief Justice's Conference Room (332)
7	Courtroom (340)

NOT FOR BIDDING PURPOSES

Castle County Courts
Lobby 1003 and Screening
July 3, 2026

<i>Description</i>	<i>Manufacture</i>	<i>Model</i>	<i>Qty</i>	<i>Each</i>	<i>Extended</i>
Display					
65" Portrait-mounted Interactive Display	Viewsonic	IFP65G1	3		\$ -
Portrait Display Mount	Premier Mounts	LMVSP	3		\$ -
					\$ -
Video					
Small Form-factor Computer (SFPC)	Lenovo	M70Q GEN5	3		\$ -
					\$ -
					\$ -
					\$ -
Audio					
					\$ -
					\$ -
Racks, Furniture and Misc					
Miscellaneous Installation Materials	Contractor	Contractor	1		\$ -
					\$ -
					\$ -
					\$ -
Control Components					\$ -
Display Components			1		\$ -
Video Components			1		\$ -
Audio Components			1		\$ -
VTC Components					\$ -
Furniture & MISC					\$ -
Room Overview					
Equipment Sub-total					\$ -
Non-Equipment Costs- (Labor, freight, G&A, MISC)					\$ -
Total					\$ -

Castle County Courts
Large Interview/Meeting Room
July 3, 2026

Included: 109

<i>Description</i>	<i>Manufacture</i>	<i>Model</i>	<i>Qty</i>	<i>Each</i>	<i>Extended</i>
Control					
Control Panel, Table top, 10"	Crestron	TS-1070-B-S	1		\$ -
Control Processor	Crestron	DIN-AP4	1		\$ -
Display					
65" 4K UHD LED Display	Samsung	QBC65	1		\$ -
Display Mount Kit	Chief	LTM1U	1		\$ -
					\$ -
					\$ -
					\$ -
Video					
HDMI/USB Active Extender Transmitter	Atlona	AT-OME-EX-TX	1		\$ -
HDMI/USB Active Extender Receiver	Atlona	AT-OME-EX-RX	1		\$ -
VTC					
Small Form-factor Computer provide with wls keyboard and mouse (SFPC)	Lenovo	M70Q GEN5	1		\$ -
All-in-one Soundbar with integrated camera, speaker and mic provide with mounting bracket (CAM01)	Logitech	Meetup2	1		\$ -
8-Port 1GB Desktop PoE+ switch (VLAN2)	TP-Link	TL-SG1008MP	1		\$ -
Racks, Furniture and Misc					
Miscellaneous Installation Materials	Contractor	Contractor	1		\$ -
Under table shelf	Extron	UTS100	1		\$ -
Control Components					\$ -
Display Components			1		\$ -
Video Components			1		\$ -
Audio Components			1		\$ -
VTC Components			1		\$ -
Furniture & MISC			1		\$ -
Room Overview					
Equipment Sub-total					\$ -
Non-Equipment Costs- (Labor, freight, G&A, MISC)					\$ -
Total					\$ -

**Castle County Courts
Medium Conference Rooms**

Includes: 110, 208, 238, 316

July 3, 2026

Description	Manufacture	Model	Qty	Each	Extended
Control					
Control Panel, Table top, 10"	Crestron	TS-1070-B-S	1		\$ -
Control Processor	Crestron	DIN-AP4	1		\$ -
Display					
75" 4K UHD LED Display	Samsung	QBC75	1		
Display Mount Kit	Chief	TS525TU	1		\$ -
					\$ -
Video					
HDMI/USB Active Extender Transmitter	Atlona	AT-OME-EX-TX	1		\$ -
HDMI/USB Active Extender Receiver	Atlona	AT-OME-EX-RX	1		\$ -
					\$ -
VTC					
Small Form-factor Computer provide with wls keyboard and mouse (SFPC)	Lenovo	M70Q GEN5	1		\$ -
All-in-one Soundbar with integrated camera, speaker and mic provide with mounting bracket (CAM1)	Logitech	Meetup2	1		\$ -
8-Port 1GB Desktop PoE+ switch (VLAN2)	TP-Link	TL-SG1008MP	1		\$ -
Racks, Furniture and Misc					
Miscellaneous Installation Materials	Contractor	Contractor	1		\$ -
Under table shelf	Extron	UTS100	1		\$ -
Control Components			1		\$ -
Display Components			1		\$ -
Video Components			1		\$ -
Audio Components			1		\$ -
VTC Components			1		\$ -
Furniture & MISC			1		\$ -
Room Overview					
Equipment Sub-total					\$ -
Non-Equipment Costs- (Labor, freight, G&A, MISC)					\$ -
Total					\$ -

Castle County Courts**July 3, 2026****October 13, 2025**

Includes: 258

Description	Manufacture	Model	Qty	Each	Extended
Control					
Control Panel, Table top, 10"	Crestron	TS-1070-B-S	1		\$ -
Control Processor	Crestron	DIN-AP4	1		\$ -
Display					
85" 4K UHD Interactive display	Samsung	WM85FX	1		\$ -
Display Mount Kit	Chief	XTM1U	1		\$ -
					\$ -
Video					
Wireless Presentation system	Wolfvision	Cynap Pro	1		\$ -
					\$ -
					\$ -
					\$ -
Audio					
Meeting Room Bundle with mics, Hub, and (4) Speakers	Biamp	MRB-L-SCX400-C	1		\$ -
					\$ -
VTC					
Small Form-factor Computer provide with wls keyboard and mouse (SFPC)	Lenovo	M70Q GEN5	1		\$ -
All in one codec, camera, microphone, speaker w/control panel (VTC)	Poly	X70	1		\$ -
8-Port 1GB Desktop PoE+ switch (VLAN2)	TP-Link	TL-SG1008MP	1		\$ -
Racks, Furniture and Misc					
Miscellaneous Installation Materials	Contractor	Contractor	1		\$ -
					\$ -
Control Components			1		\$ -
Display Components			1		\$ -
Video Components			1		\$ -
Audio Components			1		\$ -
VTC Components			1		\$ -
Furniture & MISC			1		\$ -
Room Overview					
Equipment Sub-total					\$ -
Non-Equipment Costs- (Labor, freight, G&A, mISC)					\$ -
Total					\$ -

**Castle County Courts
Seminar /Shared Classroom**

Includes Room 207

July 3, 2026

Description	Manufacture	Model	Qty	Each	Extended
Control					
Control Panel, Wall Mount, 10" (CP2)	Crestron	TW-1070-B-S	2		\$ -
Control Processor	Crestron	CP4N	1		\$ -
iPad, 10.5" 64GB with Xpanel application for remote control (CP3)	Apple	iPad Pro	1		\$ -
					\$ -
Display					
98" 4K UHD LED Display (Matte glass, no spk)	Samsung	QM98C	4		\$ -
Extra Large Display wall mount	Chief	XTM1U	4		\$ -
					\$ -
					\$ -
Video					
Wireless Presentation system	Wolfvision	Cynap Pro	2		\$ -
DM NVX Wall Plate Encoder with HDMI (AVP2)	Crestron	DM-NVX-E20-2G-W-T	4		\$ -
DM NVX 4K/60 Network AV Decoder with scaler	Crestron	DM-NVX-D200	6		\$ -
DM NVX 4K/60 Network AF Encoder (surface mnt)	Crestron	DM-NVX-E20	4		\$ -
Video Camera, white, with mounting bracket and HDBT Extender Sys (CAM2)	Vaddio	Roboshot 12E HDBT with OneLink	2		\$ -
					\$ -
					\$ -
Audio					
Recessed Ceiling Speakers 30W@70V, 110-deg (SPK1)	Crestron	SAROS ICI6T-W-T-EACH	15		\$ -
Ceiling Microphone with Beam tracking and network box	Biamp	Parle TCM-X	3		\$ -
2nd Ceiling Microphone with Beam tracking	Biamp	Parle TCM-Xex	3		\$ -
Digital Wireless Receiver (WLS REC)	Shure	ULXD4Q**	1		\$ -
Wireless Handheld with Rechargeable Battery & SBC200 charger base	Shure	ULXD2/S 455**	2		\$ -
Wireless Beltpack with Cardoid Lav WL185M, and Rechargeable Battery & SBC200 charger base	Shure	ULXD1**	2		\$ -
4 channel Audio amplifier 240W/ch	Biamp	R5 AMP 4240T	1		\$ -
Assistive listening FM System (Incl: Tranceiver, (4) rec, 4 earph, 2 NL, Remote Ant (ANT2), Chg st.	Williams Sound	FM558 Pro	2		\$ -
Digital Sound Processor	Biamp	Tesira Forte AVB CI	1		\$ -
					\$ -
					\$ -
					\$ -
Racks, Furniture and Misc					
Misc. accessories, cables, etc.	Vendor	Vendor	1		\$ -
45RU, 32" Deep Rack, Pre-Configured for AV	Middle Atlantic	BGR-4532-AV	1		\$ -
Front Plexi Door	Middle Atlantic	BPFD-45	1		\$ -
Rack Leveling Feet	Middle Atlantic	LF-HD	1		\$ -
Surge Eliminate Power Sequencer, 20A, 1RU	Surge X	SEQ-1U	1		\$ -
Rack mounted UPS, 2200VA/1650W, IP Control	Middle Atlantic	UPX-RLINK-2000R-2	1		\$ -
Network Layer-2 Stackable PoE+ Switches 48P	Cisco	C1300-48P-4X-48	1		\$ -
OFE Warranty of Network Switches, 1 Year	Cisco	Smartnet	1		\$ -
Miscellaneous Installation Materials	Contractor	Contractor	1		\$ -
ADA Compliant adjustable height Lectern	Egan	AVA *Veneer color by	2		\$ -
SUB TOTAL					\$ -
Systems Overview					
Control Components			1		\$ -
Display Components			1		\$ -
Video Components			1		\$ -
Audio Components			1		\$ -
VTC Components			1		\$ -
Furniture & MISC			1		\$ -
Room Overview					
Equipment Sub-total					\$ -
Non-Equipment Costs- (Labor, freight, G&A, MISC)			1		\$ -
Total					\$ -

Castle County Courts
Chief Justice's Conference Room
July 3, 2026

Included: 332

<i>Description</i>	<i>Manufacture</i>	<i>Model</i>	<i>Qty</i>	<i>Each</i>	<i>Extended</i>
Control					
Control Panel, Table top, 10"	Crestron	TS-1070-B-S	1		\$ -
Control Processor	Crestron	DIN-AP4	1		\$ -
Display					
75" 4K UHD LED Display	Samsung	QBC75	1		\$ -
Display Mount Kit	Chief	XTM1U	1		\$ -
					\$ -
Video					
HDMI/USB Active Extender Transmitter	Atlona	AT-OME-EX-TX	1		\$ -
HDMI/USB Active Extender Receiver	Atlona	AT-OME-EX-RX	1		\$ -
VTC					
Small Form-factor Computer provide with wls keyboard and mouse (SFPC)	Lenovo	M70Q GEN5	1		\$ -
All-in-one Soundbar with integrated camera, speaker and mic provide with mounting bracket (CAM01)	Logitech	Meetup2	1		\$ -
8-Port 1GB Desktop PoE+ switch (VLAN2)	TP-Link	TL-SG1008MP	1		\$ -
Racks, Furniture and Misc					
Miscellaneous Installation Materials	Contractor	Contractor	1		\$ -
Under table shelf	Extron	UTS100	1		\$ -
Control Components					\$ -
Display Components					\$ -
Video Components			1		\$ -
Audio Components			1		\$ -
VTC Components			1		\$ -
Furniture & MISC			1		\$ -
Room Overview					
Equipment Sub-total					\$ -
Non-Equipment Costs- (Labor, freight, G&A, MISC)					\$ -
Total					\$ -

**Castle County Courts
Courtroom
July 3, 2026**

Includes: 340

Description	Manufacturer	Model	Qty	Each	Extended
Control					
Control Panel, Table top, 10"	Creston	TS-1070-B-S	2	\$	-
Control Processor	Creston	CP4N	1	\$	-
RS232 Expander module	Creston	CEN-IO-COM-102	1	\$	-
Display					
85" 4K UHD LED Display	Samsung	Q8C85	4	\$	-
Extra Large Display wall mount	Chief	XTM1U	4	\$	-
13" Touch Sensitive Display (Clerk FPD13)	Beetronics	13HD7	3	\$	-
24" Tabletop Display (FPD24)	Samsung	F24T374FWN	9	\$	-
24" Table top Interactive Display (CM24)	Samsung	QB24R-T	2	\$	-
6RU Rackmount 13" display with speaker (RDISP)	Totevision	LED-1562HDR	1	\$	-
Tabletop mount with tilt	Ergotron	33-387-085	11	\$	-
				\$	-
				\$	-
				\$	-
Video					
DM NVX 4K/60 4:4:4 HDR Network AV Encoder	Creston	DM-NVX-360	8	\$	-
DM NVX 4K/60 4:4:4 HDR Network AV Decoder	Creston	DM-NVX-360	11	\$	-
HDMI Matrix Switcher (MTX)	Lightware	MX2-8x8-HDMI20-L	1	\$	-
Document Camera 102026	Wolfvision	VZ-8.UHD	1	\$	-
Video Camera, white, with mounting bracket and HDBT Extender Sys (CAM2, CAM3)	Vaddio	Roboshot 12E HDBT with OneLink	4	\$	-
USB Extender TX	Extron	USB Extender Plus T	1	\$	-
USB Extender RX	Extron	USB Extender Plus R	1	\$	-
Quadscreen Multiviewer	NTI	Splitmux-HD_4RT	1	\$	-
Wireless Presentation system	Wolfvision	Cynap Pro	1	\$	-
USB Capture Utility	Magewell	USB Capture HDMI GEN2	1	\$	-
1x4 HDMI Distribution Amp	Extron	DA4 HD 4K plus	1	\$	-
1x6 HDMI Distribution Amp	Extron	DA6 HD 4K Plus	1	\$	-
BlueRay DVD Player	Denon	DN500BDMKII	1	\$	-
Small Form-factor Computer (SFPC) for Room signage and Clerk	Lenovo	M70Q GEN5	2	\$	-
				\$	-
				\$	-
				\$	-
				\$	-
Audio					
"MIC2" Table top gooseneck microphone base with speaker, for quantity of mics provided (Mic2)	Televic	Confidea Flex Wired Mic Station	1	\$	-
Gooseneck Atty Mic, cardioid element 24"	Televic	PLM602F	6	\$	-
Gooseneck Microphone, cardioid element 16"	Televic	PLM402F	8	\$	-
Processor base station with Conferto smart Audio Mix minus platform and integration with FIR and licenses	Televic	Confidea Processor	1	\$	-
DSP Processor	Biamp	Tesira Forte DAN VT	1	\$	-
Digital Audio USB Extender (Aud Ext)	Biamp	Tesira EX-UBT	1	\$	-
AVB to Dante Expansion Device (DAN-EXP)	Biamp	Tesira Connect TC-5D	1	\$	-
4 channel Audio amplifier (AMP)	Biamp	AMP-A460H	1	\$	-
Wls Intercom and Interpretation transceiver (ALS Transceiver)	Williams Sound	Digi-Wave DLT 400	3	\$	-
Wls Intercom and Interp Rechargeable Receiver	Williams Sound	DLR 400RCH	4	\$	-
Headsets for Wls Intercom Receiver	Williams Sound	HED 027	4	\$	-
Neckloops for Wls Intercom Receiver	Williams Sound	NKL001	4	\$	-
Headset Mic for Wls Intercom Receiver	Williams Sound	MIC 144	2	\$	-
Charging bay for Wls Intercom	Williams Sound	CHG 412	1	\$	-
Analog Audio Converter Box for DW400 (ALS Conv)	Williams Sound	DWD 401	2	\$	-
Wall-mount Loudspeaker with Ubracket	Biamp	Desono DX-S5	2	\$	-
Boundary Microphone with switch (MIC3)	AudioTechnica	U891RCB	1	\$	-
Digital Wireless Receiver	Shure	ULXD4**	1	\$	-
Wireless Handheld with Rechargeable Battery & SBC200 charger base	Shure	ULXD2/SM58**	1	\$	-
Disc Based Mic Stand	Atlas IED	MS-20E	1	\$	-
				\$	-
				\$	-
VTC					
				\$	-
Racks, Furniture and Misc.					
Misc. accessories, cables, etc.	Vendor	Vendor	1	\$	-
45RU, 32" Deep Rack, Pre-Configured for AV	Middle Atlantic	BGR-4532-AV	1	\$	-
Front Plexi Door	Middle Atlantic	BFPD-45	1	\$	-
Rack Leveling Feet	Middle Atlantic	LF-HD	1	\$	-
Surge Eliminate Power Sequencer, 20A, 1RU	Surge X	SEQ-1U	1	\$	-
Rack mounted UPS, 2200VA/1650W, IP Control	Middle Atlantic	UPX-RLINK-2000R-2	1	\$	-
Network Layer-2 Stackable PoE+ Switcher, 48P (VLAN)	Cisco	C1300-48P-4X-48	1	\$	-
OFE Warranty of Network Switcher, 1 Year	Cisco	Smartnet	1	\$	-
Cable Cubby with local power and cables for input and desktop equipment	Lightware	TBX-M210	5	\$	-
Under table shelf	Extron	UTS100	7	\$	-
Lectern, Height adjustable, Black Oak with Clock timer and grommets opening	Egon	64100	1	\$	-
				\$	-
				\$	-
				\$	-
Control Components			1	\$	-
Display Components			1	\$	-
Video Components			1	\$	-
Audio Components			1	\$	-
VTC Components			1	\$	-
Racks, Furniture & MISC			1	\$	-
Room Overview					
Equipment Total				\$	-
Labor / ODC's - (Labor, freight, G&A, MISC)				\$	-
Total				\$	-

SECTION 28 00 00

ELECTRONIC SAFETY AND SECURITY

PART 1 PART 1 - GENERAL

1.1 SUMMARY

- A. This section includes general administrative procedural requirements for sections numbering 28 00 00, and is intended to supplement, not supersede, the requirements specified in Division 1.

1.2 GENERAL CONDITIONS

- A. Applicable requirements of Division 01 - General Conditions shall be considered a part of this section and shall have the same force as if printed herein full.
- B. The work to be done under this section of the Specifications shall include the furnishing of labor, material, equipment, and tools required for the complete installation of the work indicated on the Drawings, as specified herein, or as noted in other sections of Division 28 - Electronic Safety and Security.
- C. All materials, obviously a part of the electronic security infrastructure and necessary to its proper operation, but not specifically mentioned or shown on the Drawings, shall be furnished, and installed without additional charge.
- D. The Drawings and Specifications are complementary to each other and what is called for by one shall be as binding as if called for by both. If a discrepancy exists between the Drawings and Specifications, the higher cost and/or higher level of functionality shall be included to meet the design intent.
- E. Work and products provided must conform to the State of Delaware's Building Access Security Standard, SE-ACCESS-001. This standard as authorized by Delaware Law, Title 29, Chapter 90C mandates the use of specific technology and products to establish consistency in both quality and the security as well as interoperability.
- F. The security contractors must be an approved vendor with the Delaware Department of Technologies & Information (DTI) and currently certified on all security related systems. Submittals/work shall be restricted to vendors have met the minimum requirements and are listed as a security vendor by the manufacturers and approved by the Owners or their authorized representatives. The work detailed in these specifications and associated drawings are an expansion of the Owner's existing Security Management System (SMS). The products utilized on this project must be fully and completely compatible and supported by the Owner's existing SMS with no exceptions.
- G. The work shall consist of turnkey system comprised of these core systems:
 - 1. Access Control System
 - 2. Detention Systems

3. Security Communication Systems
4. Video Surveillance System
5. Wire and cable to install all equipment as specified herein
6. Miscellaneous conduit, power supplies, and back boxes (not shown on the Documents as provided, but required for a complete installation)

1.3 RELATED SECTIONS FOR ALL 28 SERIES SECURITY SPECIFICATIONS

- A. 01 00 00 General Requirements
- B. 07 84 00 Firestopping
- C. 10 14 00 Signage
- D. 27 00 00 Communications
- E. 28 05 13 Electronic Security Conductors and Cabling
- F. 28 13 26 Access Control Field Devices
- G. 28 13 33 Access Control System Interfaces
- H. 28 23 00 Video Surveillance
- I. 28 23 29 Video Surveillance Field Devices
- J. 28 52 20 Security Communication Systems

1.4 CODE REFERENCES

- A. All work shall be in accordance with, but not limited to, the following:
 1. American National Standards Institute (ANSI)
 2. American Society of Testing Material (ASTM)
 3. American Standards Association (ASA)
 4. Americans with Disabilities Act (ADA)
 5. Electronic Industries Association (EIA)
 6. Federal Information Processing Standard (FIPS)
 7. Federal Communications Commission (FCC)
 8. Institute of Electrical & Electronics Consultants (IEEE)
 9. Local city and county ordinances.
 10. National Electrical Manufacturers Association (NEMA)
 11. National Fire Alarm Association (NFPA)
 12. Occupational Safety and Health Administration (OSHA)
 13. State of Delaware's Building Access Security Standard, SE-ACCESS-001
 14. Telecommunications Industries Association (TIA)
 15. The National Electrical Code (NEC)
 16. Underwriters Laboratories (UL)
- B. In the event of conflicts, the more stringent provisions shall apply.

1.5 DEFINITIONS

- A. The following definitions of terms supplement those of the General Requirements and are applicable to all sections of Division 28 - Electronic Safety and Security:
1. Provide: As used herein shall mean furnish, install, and test (if applicable) complete.
 2. Infrastructure: As used herein shall mean cable, conduit, and raceway with all required boxes, fittings, connectors, and accessories; completely installed.
 3. Work: As used herein shall be understood to mean the materials completely installed, including the labor involved to meet the design intent.
- B. As used in the Documents for the Work, certain non-technical words and phrases shall be understood to have specific meanings as follows, regardless of indications to the contrary in the General Conditions or other documents governing the Work:
1. "Furnish" – Purchase and deliver to the project site complete with every necessary appurtenance and support, all as part of the Work. Purchasing shall include payment of all sales taxes and other surcharges as may be required to assure that purchased items are free of all liens, claims, or encumbrances.
 2. "Turnkey" – Shall include both Furnish and Install requirements. In addition, the contractor provides all integration, training, programming of logic events between security subsystems, device analytics, analytics event logic, and features as deemed required by the owner or their authorized representative.
 3. "Install" – Unload at the delivery point at the site and perform every operation necessary to establish secure mounting and correct operation at the proper location in the project, all as part of the Work.
 4. "New" – Manufactured within the past year and never used.
- C. Regardless of their usage in codes or other industry standards, certain words or phrases as used in the Documents for the Work, shall be understood to have the specific meanings as ascribed to them in the following list:
1. "As indicated" – As shown on, and/or in accordance with, the Documents.
 2. "Circuit" – Any specific run of circuitry
 3. "Circuitry" – Any Work which consists of wires, cables, raceways, and/or specialty wiring method assemblies complete with associated junction boxes, pull boxes, outlet boxes, joints, couplings, splices, and connections except where limited to a lesser meaning by specific description.
 4. "Concealed" (as applied to circuitry) – Covered completely by building materials, except for penetrations (by boxes and fittings) to a level flush with the surface as necessitated by functional or specified accessibility requirements.
 5. "Documents" – The term "Documents" means all security and security related drawings, specifications, and associated sketches, details, riser diagrams, etc.
 6. "Exposed" (as applied to circuitry) – Not covered in any way by building materials.
 7. "Patch Panel" – A system of terminal blocks, patch cords, and backboards that facilitate administration of cross-connecting cables.
 8. "Raceway" – Any pipe, duct, extended enclosure, or conduit (as specified for a particular system) which is used to contain wires, and which is of such nature as to require that the wires be installed by a pulling in procedure. Where the word "conduit" is used without specific reference to type, it shall be understood to mean "raceway".
 9. "Relocate existing" – Remove existing item from present location. Reinstall, re-connect, and test existing item and make ready for use at new location as indicated.
 10. "Remove existing" – Remove existing item and return item to Owner.

11. "Replace" – Remove existing item and return item to Owner. Provide new item as indicated.
12. "Riser" – Shall refer to the portion of the installation that transmits between building floors or between security system rooms; also referred to as "Backbone Cabling".
13. "Security Closet" – The enclosed area or room specifically designated for the routing, termination, and/or cross connecting of security system cable to other security system cable and/or equipment.
14. "Security system Wiring" – see "Circuitry".
15. "Security system Work" – See "Work".
16. "Standard" (as applied to wiring devices) – Not of a separately designated individual type.
17. "Wiring" – See "Circuitry".

1.6 CONFIDENTIALITY REQUIREMENT

- A. The Work is critical to the security of the Owner's facility. All Documents and other material and information about the Work are confidential information and must always remain secure and confidential. Confidential information must not be deliberately or inadvertently disclosed to anyone other than the Contractor's personnel and subcontractors who require disclosure to perform their portion of the Work.
- B. The Contractor shall always keep track of all confidential information and shall ensure that all copies are always accounted for. The Contractor shall not permit any persons to have access to the confidential information of the Work unless and until the Contractor has assured itself of the trustworthiness of such persons.

1.7 GENERAL REQUIREMENTS

- A. The Contractor represents that they are familiar with and have expertise in the Work of this nature and scope. The Contractor further agrees that they shall provide all Work as may be required to make a complete job of that which may not be fully defined in the Documents.
- B. The security contractor shall be certified by the system manufactures for security systems as listed in the appropriate sections of these documents.
- C. The Contractor shall comply with all the regulations of municipal, city, local and other government agencies having jurisdiction concerning the work of the Contractor. The Contractor shall give all notices and comply with all laws, ordinances, codes, rules, and regulations bearing on the conduct of the Work. If the Contractor performs any work, which is contrary to such laws, ordinances, codes, rules, and regulations, they shall make all changes for compliance and bear all associated costs.
- D. The Contractor shall be responsible to provide and maintain a storage facility. If this storage facility is required to be on-site it shall be the Contractor's responsibility to coordinate the size and spatial requirements with the Owner. The Contractor shall assume full responsibility for the storage facility and all contents, unless otherwise indicated by the Owner.
- E. The Contractor shall utilize good housekeeping practice with respect to their work including cleanup of all dirt and debris created by the Contractor during installation operations daily.

- F. The Contractor shall provide all protection necessary to safeguard their work from damage by their operations and the operations of others. Unless the Contractor proves to the Owner's satisfaction that the Work has been damaged by others, the Contractor shall promptly repair, adjust, and clean all defective installations and bear all associated costs.
- G. All Contractor's work shall be tested and inspected by all authorities having jurisdiction and in accordance with all Specifications. The Contractor shall coordinate and cooperate fully and shall provide at no additional cost to the Owner, manpower, blueprints, facilities, scaffolds, etc. to reasonably assist the inspectors.
- H. The Contractor shall examine the site and the Documents and review with the Owner the designated areas of access, delivery, and storage for the Contractor's use. The Contractor agrees that such areas are satisfactory and sufficient for their needs in the completion of their work and in conformance with the terms of this Contract.
- I. Should any questions of union jurisdiction arise, the Contractor shall immediately take steps to settle such disputes and shall use such labor as may be determined to have jurisdiction, at no additional cost to the Owner. Should the Contractor fail to take expeditious action, they shall be responsible for any time lost because of delays arising from such a dispute.
- J. The Owner reserves the right to furnish any materials necessary for the Project.
- K. All permits required for any part of the Contractor's work shall be procured and paid for by the Contractor. The Contractor shall determine all permits required and transmit this information to the Owner.
- L. The Contractor warrants that both they and their subcontractors are licensed as required by the authorities having jurisdiction and as required by local ordinances.
- M. The Contractor must state if they intend to utilize a subcontractor and provide said subcontractor's name and address. The subcontractor shall comply with all the same rules, regulations, laws, codes, licenses, etc. as required by the Contractor and as specified herein. The Owner reserves the right to approve or disapprove any subcontractor proposed by Contractor.
- N. The Owner shall provide to the Contractor AutoCAD backgrounds for all required floor plans for the facility. All pre-fabrication and record drawings required for the Project and as stated herein, shall be completed within the latest version of AutoCAD.
- O. The Contractor, upon receiving notice from Owner that the Contractor has furnished inferior, improper or unsound work or materials (including equipment), or work or materials at variance with that which is specified, will, within 24 hours, proceed to remove such work or materials and make good all other work or materials damaged thereby, and, at the option of the Owner, the Contractor shall immediately replace such work or materials with work or materials as specified. The removal, replacement, and repair shall be performed at such times and with manpower sufficient, in the judgment of the Owner, to avoid disturbance to occupants, or other ongoing work for the Project.
 - 1. If the Contractor does not remove such unsound Work within a reasonable time, the Owner may remove it and may store the material at the expense of the Contractor. If the Contractor does not pay the expenses of such removal within ten (10) days' time thereafter, the Owner may, upon written notice, sell such materials at auction or at private

- sale and shall account for the net proceeds thereof, after deducting all the costs and expenses that should have been borne by the Contractor and all expenses of the sale.
2. The Owner shall always have the authority, until final completion and acceptance of the Work, to inspect and reject work and materials which in its judgment are not in conformity with the Documents, and its decision regarding character and value of Work shall be final and conclusive on both contracting parties. If the Owner permits said Work or materials to remain, the Owner shall be allowed the difference in value or shall at its election have the right to have said Work or materials repaired or replaced, as well as the damage caused thereby, at the expense of the Contractor, at any time within one (1) year after the completion of the entire project, or within such longer period as may be covered by any guaranty; and neither payments made to the Contractor, nor any other acts of the Owner, shall be construed as evidence of acceptance, waiver, or estoppel.
 3. Any expense incurred by the Owner in connection with the foregoing, shall be borne by the Contractor, and the Owner may withhold money due to the Contractor or recover money already paid to the Contractor, to the extent of such expense.
- P. To the extent that they govern the Work, the Documents also govern change order Work, if any.
- Q. The Documents for the Work utilize symbols and schematic diagrams that have no dimensional significance. The Work shall be installed to fulfill the diagrammatic intent expressed on the Documents, field layouts, and shop drawings of all trades.
- R. Certain details appear on the Documents for the Work that is specified with regard to the dimensioning and positioning of the Work. These are intended only for general information purposes. They do not obviate field coordination for individual items of the indicated Work.
- S. Information as to general construction and architectural general construction and architectural features and finishes shall be derived from the structural and architectural Documents only.
- T. Ratings of devices, materials, and equipment specified without reference to specific performance criteria shall be understood to be nominal or nameplate ratings established by means of industry standard procedures.
- U. It is the intent of the Documents to provide a complete operating security system. All Work necessary to provide such a system shall be performed. Any discrepancies shall be brought to the Consultant's attention.
- V. The Work called for under this Contract shall be carried on simultaneously with the Work of other trades and Owner functions in such a manner as to not delay the overall progress of the construction project. The Contractor is responsible for all coordination of the Work with other trades.
- W. Include in the Work all necessary supervision and issuing of all coordination information to any other trades who are supplying work to accommodate the security system installation.
- X. For items of equipment which are to be installed but not purchased as part of the Work, the Work shall include:
1. Coordination of delivery
 2. Unloading from delivery trucks
 3. Safe handling and field storage up to the time of permanent placement in the project

4. Correction of any damage to the item(s)
5. Mounting in place and connection(s) as specified.

- Y. Items which are to be installed but not purchased as part of the Work shall be carefully examined upon delivery to the project. Claims that any of these items have been received in such condition that their installation will require procedures beyond the reasonable scope of the Work will be considered only if presented in writing within one (1) week of the date of delivery to the project of the items in question. The Work includes all procedures necessary to put in satisfactory operation all items for which no claims have been submitted as outlined above.
- Z. The Contractor shall identify the cable types, quantities, and lengths required and provide them to be ordered. It is the Contractor's responsibility to ensure that the information is complete and accurate. Any errors or omissions in the ordering information will be the responsibility of the Contractor.

1.8 PROJECT DRAWINGS

- A. Drawings are generally diagrammatic and show design intent, the arrangement and location of pathways, outlets, support structures, and equipment. Carefully investigate the structural and finish conditions affecting his work and arrange his work accordingly. Should conditions on the job make it necessary to adjust pathways or materials, advise and secure approval before proceeding with such work.
- B. It shall be understood that the Specifications and Drawings are complementary. Where there are conflicts between the Documents or within the Specifications or Drawings themselves, the overall design intent shall govern.
- C. Where exact locations are required by equipment for stubbing-up and terminating conduit concealed in floor slabs, request Drawings, equipment location Drawings, foundation Drawings, and any other data required to locate the concealed conduit before the floor slab is poured.
- D. Materials, equipment, or labor not indicated but which can be reasonably inferred to be necessary for a complete installation shall be provided. Drawings and Specifications do not undertake to indicate every item of material, equipment, or labor required to produce a complete and properly operating installation.
- E. The right is reserved to make reasonable changes in locations of equipment indicated on Drawings prior to rough-in without increase in contract cost.
- F. The size or number of conduit runs indicated shall not be reduced without written approval.
- G. Any work installed contrary to contract Drawings shall be subject to change as directed, and no extra compensation will be allowed for making these changes.
- H. The location of equipment, support structures, outlets, and similar devices shown on the Drawings are approximate only. Do not scale Drawings. Obtain layout dimensions for equipment from architectural plans unless indicated on the Drawings.

- I. Schematic diagrams shown on the Drawings indicate the required functions only. The technology of a particular manufacturer may be used to accomplish the functions indicated without exact adherence to the schematic Drawings shown. Additional labor and materials required for such deviations shall be furnished at no additional expense.
- J. Verify the ceiling type, ceiling suspension systems, and clearance above hung ceilings prior to ordering cabling and associated hardware. Provide notification of any discrepancies.
- K. Portions of these Drawings and Specifications are abbreviated and may include incomplete sentences. Omissions of words or phrases such as "shall," "shall be," "as indicated on the Drawings", "In accordance with", "a", "the", and "all are intended" shall be supplied by inference.

1.9 QUALITY ASSURANCE

A. Contractor Qualifications:

1. Work specified herein shall be the responsibility of a single Security Contractor. Bid submission shall document a minimum of five years' experience in the fabrication, assembly, and installation of systems of similar complexity as specified herein. The documentation shall include the names, locations, and points of contact for at least three installations of the type and complexity specified herein.
2. The Contractor shall have local in-house engineering and project management capabilities consistent with the requirements of the Work.
3. By submitting a bid, the Contractor thereby certifies that it is qualified in all areas pertaining to, directly or indirectly, the Work. In the event the Contractor becomes unable to complete the Work in accordance with the Documents, or the satisfaction of the Owner, it shall be the responsibility of the Contractor to retain the services of applicable manufacturers' representatives to expeditiously complete the Work in accordance with the Owner's construction schedule with no additional cost to the Owner.
4. The Contractor shall maintain, or establish and maintain, a fully staffed office including a service center capable of providing maintenance and service to the Project. The Contractor shall staff the service center with factory trained technicians and adequately equip the office to provide emergency service within four (4) hours after being called, 24 hours per day.
5. The Contractor shall provide factory-certified technicians to install, commission, and maintain the Work. All installing personnel shall be licensed as required by local and/or state jurisdictions.
6. The Contractor shall ensure compliance with, and have a thorough understanding of, all local codes and contract conditions pertaining to this Project.
7. The Contractor shall maintain an inventory of spare parts and other items critical to system operation and as necessary to meet the emergency service requirements of this Project within the local service center.
8. The Contractor shall provide current certifications for the systems under Division 28. All certifications must be current and achieved prior to the project bid date.
 - a. Honeywell Pro-Watch access control system
 - b. Milestone video surveillance system.
9. The work requires a Contractor to have current certifications in these additional networks based certifications:
 - a. Microsoft Certified Professional
 - b. Microsoft Certified System Administrator
 - c. CompTIA A+ Certified

d. CompTIA Network + Certified

B. Product Standards:

1. All equipment and materials for contained herein shall be the products of recognized manufacturers and shall be new.
2. New equipment and materials shall:
 - a. Be Underwriters Laboratories, Inc. (UL.) listed and approved where specifically called for; or where normally subject to such UL labeling and/or listing services.
 - b. Be clearly labeled identifying make, model, and manufacturer.
 - c. Be without blemish or defect.
 - d. Be products that meet with the acceptance of the agency inspecting the security systems work.
3. It is the intent of these specifications that wherever a manufacturer of a product is specified, and the terms "other approved" or "approved equal" are used, the substituted item must conform in all respects to the specified item. Consideration will not be given to claims that the substituted item meets the performance requirements with lesser construction. Performance as delineated in schedules and in the specifications shall be interpreted as minimum performance.
4. Substituted equipment or optional equipment, where permitted and approved, must conform to space requirements. Any substituted equipment that cannot meet space requirements, whether approved or not, shall be replaced at the Contractor's expense. Any modifications of related systems as a result of substitutions shall be made at the Contractor's expense.
5. The approval of shop drawings, or other information submitted in accordance with the requirements hereinbefore specified, does not ensure that the Security Consultant, Architect, or the Owner attests to the dimensional accuracy, dimensional suitability of the material, or mechanical performance of equipment. Approval of shop drawings does not invalidate the Documents.
6. Substitutions of equipment shown on the schedules or designated by model number in the specifications will not be considered if the item is not a regular catalogued item carried by the manufacturer.
7. Manufacturers Recommendations: Where installation procedures of any part thereof are required to be in accordance with the recommendations of the manufacturer of the material being installed, printed copies of these recommendations shall be furnished prior to installation. Installation of the item will not be allowed to proceed until the recommendations are received. Failure to furnish these recommendations may be cause for rejection of the material.
8. The Contractor shall provide a complete fit-out of the security closets for review by the Consultant and Owner prior to continuing with the installation of the other security closets. The closet fit-out shall include all cabinets, conduit, blocks, patch panels, frames, labels, etc.
9. The Contractor shall provide a complete fit-out of all command center equipment for review by the Security Consultant and Owner. The fit-out shall include all devices, console layouts, furniture, labeling, cable support, etc.
10. Within the Specifications, certain manufacturers have been listed. These manufacturers are listed for example purposes (unless followed by "No Exceptions"). The Contractor may substitute manufacturers and models that may be more cost effective or readily available than that specified. However, all substitutions shall meet or exceed the specified functional and technical requirements. Acceptance of such substitutions is at the discretion of the Consultant and/or Owner.

11. All exterior devices shall be sealed and protected against all weather conditions consistent with the region including heat, cold, moisture, dust, etc.

1.10 PROJECT MANAGEMENT

- A. The Contractor shall provide a Project Manager to oversee and coordinate all activities on the Project
- B. Project Manager's Duties and Responsibilities:
 1. The Contractor shall provide to the Owner, as a part of the prefabrication submittal, the name of the Project Manager that will provide all duties and responsibilities as specified herein, during the term of the project.
 2. The Project Manager shall maintain the ability of making all managerial decisions on behalf of the Contractor on a day-to-day basis and shall retain the authority of accepting notices of deduction, inspection reports, payment schedules and any other project related correspondence on behalf of the owner.
 3. The Project Manager shall schedule and attend project management meetings, during which time all system related issues are discussed, scheduled, confirmed, and/or resolved.
 4. The Project Manager shall be available during normal business hours (ex. 08:00 to 17:00) within two (2) hours by telephone during the term of the project:
 - a. After normal business hours, the Project Manager shall be available within four (4) hours by telephone during the term of the project.
 - b. In the event that the Project Manager is not available within the allotted time frame, the Contractor may designate another employee to temporarily act as the Project Manager in all correspondence with the Owner.
 - c. The Contractor shall ensure that any individual temporarily assuming the duties of the Project Manager is at equal or higher level in the Contractor's managerial chain of command.
 5. Upon notification by the Owner, of any project related installation issue, or issue that may contradict the Specifications as stated herein, the Project Manager shall respond to such issue, verbally and/or in writing within an eight (8) hour period:
 - a. Responses to such issues as stated above shall include a clear understanding of the issue, along with a tentative plan of action, reflecting milestones and/or deadlines to resolve the issue.
 - b. Where appropriate, based on the overall importance of the project issue, the Project Manager shall follow-up their initial response with a written response to the issue within 24 hours of identification of the issue.

1.11 SEQUENCING

- A. This implementation plan describes the general approach that shall be followed to minimize the time for the access control systems to be operational.
- B. Plan and schedule all work in such a sequence as to minimize the time before the system is operational. The following is a suggested work sequence:
 1. Order all equipment needed and notify any subcontractors to schedule their participation.
 2. Perform all system layout work.
 3. Insure there are an adequate number of power receptacles available to operate all security equipment and coordinate as to where power is available.

4. Provide shop Drawings to verify location of all equipment, conduit runs, power connections, etc. Submit shop Drawings to Project Manager.
5. Coordinate to provide space in each building's Communications Room for mounting of processors.
6. Provide training on how to fill out the programming sheets for access levels.
7. Prepare and pre-test all equipment to the greatest extent possible.
8. Install all equipment.
9. Provide training on the programming other various options.
10. Test and inspect all systems.
11. Perform all other Work as required.
12. Perform the Acceptance Test.
13. Provide training.
14. Provide as-built Drawings.

1.12 SCHEDULING

- A. Within five (5) days after being awarded the contract, prepare and submit for information, an estimated progress schedule for the Work. The progress schedule shall be related to the entire project and shall indicate start and completion dates.

1.13 WARRANTY AND MAINTENANCE

- A. Security Contractor shall provide a two (2) year warranty for the Work. The warranty shall cover all Work, systems, and subsystems against defects in materials and workmanship. The Work as specified herein, including all materials and labor, but excepting any existing devices and equipment which are incorporated in the completed Work, shall be warranted to be free from defects in design, workmanship, and materials. Further, the Contractor shall warrant that the completed systems, including all components (except those, which are existing or provided by others), are of sufficient size and capacity to fulfill the requirements of the Specifications.
- B. The warranty shall be valid for a period of one year following the date of system acceptance by the Owner. System acceptance shall commence when all parts, components, sub-systems, and systems have been tested, shown to be working in accordance with the Specification, and approved by the Owner.
- C. Nothing contained in the Documents shall be construed to establish a shorter period of limitation with respect to any other obligation, which the Contractor might have under the Documents or any manufacturer's warranty. The establishment of the time period of one year after the date of final acceptance of the Work or such longer period of time as may be prescribed by law or by the terms of any warranty required by the Documents, relates only to the specific obligation of the Contractor to correct the Work, and has no relationship to the time within which its obligation to comply with the Documents may be sought to be enforced, nor to the time within which proceedings may be commenced to establish the Contractor's liability with respect to its obligations other than specifically to correct the Work or equipment.
- D. Warranty Service:
 1. If defects in the materials and/or workmanship are identified during the warranty period, the Contractor shall provide all labor and materials as may be required for prompt correction of the defect.

2. During the warranty period, the Contractor shall, upon receipt of a request for service from the Owner, deploy service personnel to the Owner's premises within four hours to initiate corrective action.
 3. All warranty service and repair work shall be performed by personnel, who have been trained, certified, and is experienced in the operation and maintenance of the installed system(s).
 4. Unless otherwise requested by the Owner, warranty service shall be performed during normal business hours, exclusive of Holidays. If the Owner requests warranty service to be performed during other than normal business hours, the Contractor shall be compensated for such service at 150% of his normal hourly service rates as listed in the bid proposal for this project.
 5. Warranty service shall include the replacement of all parts and/or components as required to restore normal system operation.
 6. It shall be the responsibility of the Contractor to maintain an inventory of spare parts or to arrange for manufacturer parts support as required ensuring correction of all critical component failures or malfunctions within 48 hours of the Owner's request for service. Critical parts shall be defined as those, which govern or affect the normal operation of more than one field device.
 7. The Contractor's warranty obligation shall include correction of any software/firmware defects, which may be identified during the warranty period. Any failure of the software/firmware to perform as specified by the software/firmware manufacturer at the time of final acceptance shall be defined as a software/firmware error.
 8. If the Contractor determines and successfully demonstrates to the Owner that service or repairs are required as a result of misuse, abuse, or abnormal wear and tear, the Contractor shall be compensated for such service or repairs at the Contractor's hourly rates as listed in the bid proposal for the Project. Similarly, such compensation to the Contractor shall apply if repairs are required for devices and equipment not provided by the Contractor but incorporated in the completed systems.
 9. Immediately following the completion of a warranty repair or service call, the Contractor's service personnel shall submit a written report to the Owner which details the service work performed, the cause of the trouble, and any outstanding work which is required to restore complete and normal operation.
- E. The Owner reserves the right to expand or add to the system during the warranty period using firm(s) other than the Contractor for such expansion without affecting the Contractor's responsibilities, provided that the expansion is done by a firm which is an authorized dealer or agent for the equipment or system being expanded.
- F. The Contractor shall perform preventative maintenance during the warranty period as part of the warranty service. The Contractor shall submit a list of items to be included in the preventative maintenance program and the service to be performed.
- G. Include a manufacturer's software maintenance agreement as part of the Warranty. This agreement shall include all software updates, revisions, telephone service assistance, and training for any changes in operation.
- H. Provide written notice to the Owner documenting any Work performed during the warranty period, including any preventative maintenance Work performed.
- I. Provide loaner equipment that is fully compatible with the SMS for any equipment that is not field repairable.

- J. Loaner equipment for components that must be shipped to/from the manufacturer or distributor shall be on site and operational within 48 hours of the component failure. Furnish lists of equipment that will require shipment from the manufacturer or distributor and lead times associated with that equipment.
- K. Repair or Replacement Service:
 - 1. Repair or replacement service during the warranty period shall be performed in accordance with the following schedule:
 - a. Schedule A: 7 days, 24 hours per day with a four (4) hour response time
 - b. Schedule B: Normal business hours, excluding holidays, with a four (4) hour response time.
 - 2. Schedule A shall apply for major system components including, but not limited to, the file servers, system workstations, control panels, intercom exchange and master stations, and any other components that would create security vulnerabilities if non-functional.
 - 3. Schedule B shall apply for all other components and devices.
 - 4. As part of the proposal submission, the Contractor shall include a labor rate schedule for any warranty service required during hours not covered under Schedule B.
- L. Failure to Perform Service:
 - 1. Schedule A Components: The Contractor shall provide 14 days of additional total system warranty (at no additional cost to the Owner) for every two (2) consecutive days of system or device failure.
 - 2. Schedule B Components: The Contractor shall provide seven (7) days of additional total system warranty (at no additional cost to the Owner) for every two (2) consecutive days of system or device failure.
- M. If the Contractor is unable to restore system operation during the warranty period within two (2) business days of a system failure, the Owner reserves the right to require the Contractor to provide on-site manufacturer's service technicians at no cost to the Owner.
- N. Provide on-line software maintenance and support during the warranty period including all software and hardware.

1.14 EXTENDED MAINTENANCE

- A. Provide as part of the bid submission a quote for annual costs for the second through fifth years for an extended maintenance agreement to provide repair service including all parts and labor and a preventative maintenance program on the system. Provide a list of all items, schedules, and services included in the preventative maintenance program with the bid. Pricing shall be formatted to provide the Owner with the yearly breakdown of costs.
- B. Provide as part of the bid submission a quote to include annual costs for the second through fifth years for a manufacturer's software maintenance agreement after the warranty period has expired. The software maintenance agreement shall include all software updates, revisions, and unlimited telephone technical support. The software maintenance agreement shall include training for any changes in operation due to software revisions.
- C. The extended maintenance agreement shall include a periodic preventative maintenance program. Submit a list of items to be included in the periodic preventative maintenance program. This program shall be at least as comprehensive as the program provided under the warranty service.

D. Compliance:

1. Bidders shall submit a Statement of Qualifications with the bid proposal that shall include the following information:
 - a. Company name, address, telephone number, and contact person
 - b. Brief company history
 - c. Resumes of key personnel to include the following:
 - 1) History with firm
 - 2) Project experience to include role performed on various projects.
 - d. Local staffing description (job descriptions and numbers of persons in each position)
 - e. Local service capabilities (hours of operation and parts availability)
 - f. Description of local engineering and project management capabilities
 - g. List of references describing three (3) completed projects of similar size and complexity, including names and telephone numbers of the contact persons
 - h. Licensing information.
2. Provide a specification compliance statement indicating deviations from items in the specification. Indicate an exception to the requirement by the word "Exception" following the applicable paragraph number. Should the proposed equipment and/or services not entirely comply with the requirements specified, but ultimately achieve the intent, the Bidder shall explain fully the extent, or lack thereof, of compliance for the applicable equipment and/or services proposed. Instances where there is no indication of exception taken shall be considered compliant.
3. Additionally, as described in this Specification, bidders shall submit the following information with their bid proposal:
 - a. Maintenance Proposal and a Sample Maintenance Contract describing the nature of the Maintenance Service to be provided after the warranty period has expired.
 - b. Manufacturer's literature sheets for all standard manufactured items included in the equipment lists and as proposed in the Mandatory and Voluntary Alternate Bid forms.
 - c. Owner shall have the sole option to exercise the Maintenance Proposal submitted by Contractor.
 - d. Number all pages of the bid submittal.

1.15 SUBMITTALS

- A. Submit for approval, details of all materials, equipment, and systems to be furnished. Work shall not proceed without approval of the submitted items.
- B. General Description and Requirements:
 1. Submit pre-fabrication submittals in accordance with the construction schedule.
 2. Pre-fabrication submittals shall consist of product data, Shop Drawings, samples, and a detailed completion schedule. Partial submittals will not be accepted without prior written approval.
 3. No portion of the Work shall commence, nor shall any equipment be procured until approval of the pre-fabrication submittals has been given in writing.
 4. A letter of transmittal identifying the name of the Project, Contractor's name, and date submitted for review shall accompany pre-fabrication submittals along with a list of items transmitted.
- C. Product data required as part of the pre-fabrication submittal shall include the following:
 1. Equipment schedules listing all system components, manufacturer, model number and the quantity of each

2. General functional descriptions for each system
 3. Manufacturer's data specification sheets for all system components, including any warranty information (sheets containing more than one device or component model number shall be clearly marked to delineate items included in the Work)
 4. A complete list of cable and wiring types, sizes, manufacturer, and model number
 5. A complete list of finishes and sample graphics, including custom artwork and custom graphics (if applicable)
 6. List of parts inventory to provide manufacturer recommended service and maintenance of the Work.
- D. Shop Drawings shall include the following:
1. Floor plan drawings indicating device locations with device legends
 2. System riser diagram with all devices, wire runs, and wire designations
 3. Schematic block diagrams for each system showing all equipment, interconnects, data flow, etc.
 4. Wiring diagrams for each subsystem defining the interconnection of all inputs and outputs for all equipment
 5. Wiring diagram for fail-safe release of electric locking mechanical
 6. Fabrication Shop Drawings for all custom equipment (if applicable)
 7. Plans and elevations of the security console(s) and equipment racks quantifying all equipment to be mounted therein
 8. Elevations of security closet layouts showing panel locations, power supply locations, conduit, wire ways, wire molds, and all other equipment
 9. Submit samples of any equipment components upon request.
 10. Samples submitted shall be the latest version of equipment.
 11. It is the responsibility of the Contractor to confirm all dimensions, quantities, and the coordination of materials and products supplied by the Contractor with other trades. Approval of Shop Drawings containing errors does not relieve the Contractor from making corrections at their expense.
 12. Submittals for individual systems and equipment assemblies that consist of more than one item or component shall be made for the system or assembly as a whole. Partial submittals will not be considered, reviewed, or stored and such submittals will not be approved.
 13. Shop Drawings shall include equipment racks, patch panels, termination blocks, connection details, rack mounting details, and any other details not included in the Construction Drawings.
- E. Any materials and equipment listed that are not in accordance with Specification's requirements may be rejected.
- F. The approval of material, equipment, systems, and Shop Drawings is a general approval subject to the Drawings, Specifications, and verification of all measurements at the job. Approval does not relieve the responsibility of shop drawing errors. Carefully check and correct all Shop Drawings prior to submission for approval.

PART 2 - PRODUCTS

2.1 SUBSTITUTIONS

- A. Where equipment is identified by manufacturer and catalog number, it shall be as the base of requirements for quality and performance. Where manufacturers for equipment are identified

by name, it is allowable to submit prior to bidding, for approval, similar equipment of other manufacturers as substitution. The decision as to whether the submitted equipment is acceptable shall be final and binding.

- B. All changes necessary to accommodate the substituted equipment shall be made with no additional expense and shall be as approved. Detailed Drawings indicating the required changes shall be submitted for approval at the time the substitution is requested.
- C. If substitutions are made in lieu of device specified; form, dimension, design, and profile and list of any impacts to other trades shall be submitted for approval.
- D. Submit request for approval of substitute materials in writing at least ten days prior to bid opening.

2.2 MATERIALS

- A. All materials used in this work shall be new and shall bear the inspection label of Underwriters Laboratories Inc. or certification by other recognized laboratory as required.
- B. The published standards and requirements of the Telecommunications Industries Association (TIA), National Electrical Manufacturers Association (NEMA), the American National Standard Institute (ANSI), the Institute of Electrical and Electronic Consultants (IEEE), and the American Society of Testing Materials (ASTM), are made a part of these Specifications and shall apply wherever applicable.
- C. Materials and equipment furnished shall be of current production by manufacturers regularly engaged in the manufacture of such items, for which replacement parts are available.
- D. When more than one unit of the same class of equipment or material is required, such units shall be the products of a single manufacturer or partner manufacturers that offer a certified solution.
- E. Components of an assembled unit need not be products of the same manufacturer but must offer a certified end-to-end solution.
- F. Manufacturers of equipment assemblies, which include components made by others, shall assume complete responsibility for the final assembled unit.
- G. Components shall be compatible with each other and with the total assembly for the intended service.

PART 3 - EXECUTION

3.1 LANGUAGE USAGE

- A. English language shall be used throughout the security system, signage, labels, voice messages, instructions, manuals, software, and graphic displays.

3.2 EXAMINATION OF CONDITIONS

- A. Prior to the start of work, carefully inspect the installed work of other trades and verify that such work is complete to the point where installation may properly commence. Start of work indicates acceptance of conditions.
- B. Install equipment in accordance with applicable codes and regulations, the original design intent, and the referenced standards.
- C. In the event of a discrepancy, immediately provide notification notify the Project Manager.
- D. Do not proceed with installation until unsatisfactory conditions and discrepancies have been fully resolved.

3.3 PROTECTION OF SYSTEMS AND EQUIPMENT

- A. Protect materials and equipment from damage during storage at the site and throughout the construction period. Equipment and materials shall be protected during shipment and storage against physical damage, dirt, theft, moisture, extreme temperature, and rain.
- B. Damage from rain, dirt, sun, and ground water shall be prevented by storing the equipment on elevated supports and covering the sides with securely fastened protective rigid or flexible waterproof coverings.
- C. During installation, equipment shall be protected against entry of foreign matter on the inside and be cleaned both inside and outside before testing, operating, or painting.
- D. As determined by the Project Manager, damaged equipment shall be fully repaired or shall be removed and replaced with new equipment to fully comply with requirements of the contract documents. The decision of the Project Manager shall be final.
- E. Damaged paint on equipment and materials shall be repainted with painting equipment and finished with the same quality of paint and workmanship as used by the manufacturer.

3.4 ACCESS TO EQUIPMENT

- A. Equipment shall be installed in location and manner that will allow convenient access for maintenance and inspection.
- B. Working spaces shall be not less than specified in the National Electrical Code (NEC) for voltages specified.
- C. Where the Project Manager determines that the installed equipment is not conveniently accessible for operation and maintenance, equipment shall be removed and reinstalled, one time only, as directed by the Project Manager, at no additional cost. "Conveniently accessible" is defined as being capable of being reached without the use of ladders or without climbing or crawling under or over obstacles such as motors, pumps, belt guards, transformers, piping, and duct work, except where required by design or intent.

3.5 INSTALLATION

- A. The Contractor shall carefully follow the instructions in the manufacturers' Installation Manual to ensure all steps have been taken to provide a reliable, easy to operate system.

- B. The Administrator Terminal shall be connected to the remote terminals before connecting to any card reader processors.
- C. Perform all Work as indicated in the Drawings and Specifications.
- D. The Contractor shall install the appropriate cable from the CPU to readers, door contacts, request-to-exit devices, and electric locks at each door and/or gate.
- E. All communications cables shall be kept away from power circuits.
- F. The Contractor shall install the power supply(s) for electric locks in locations where they won't interfere with other operations.
- G. The Contractor shall also execute adequate testing of the system to insure proper operation.
- H. The Contractor shall provide adequate training of the system users to ensure adequate understanding to prevent operating errors.

3.6 WORKMANSHIP

- A. Comply with highest industry standards, except when specified requirements indicate more rigid standards or more precise workmanship.
- B. Perform Work with persons experienced and qualified to produce workmanship specified.
- C. Maintain quality control over suppliers and Subcontractors.
- D. Quality of workmanship is considered important. Project Manager will have the authority to reject Work which does not conform to the Drawings and Specifications.

3.7 EQUIPMENT PRE-TEST

- A. All equipment shall be bench tested as per manufacturer's instructions prior to delivery to job site and prior to installation.

3.8 WIRE AND CABLE

- A. Design, layout, size, and plan new wire and cable runs as required.
- B. All wire and cable from the processors to all devices at each door shall be "home-run" unless otherwise specified.
- C. All wire and cable, including any wire and cable that is existing and will be reused in the Work, shall be installed in conduit or surface metal raceway, except as follows:
 - 1. Wire or cable, in lengths of less than ten (10) feet, that is "fished" within walls, ceilings, and doorframes.
- D. All wire and cable passing thru metalwork shall be sleeved by an approved grommet or bushing.
- E. Avoid splicing conductors. All splices shall be made in junction boxes (except at equipment). Splices shall be made with an approved crimp connection. Wire nuts shall not be used on any

low-voltage wiring. Where necessary, provide heat-shrink to insulate all wire splices and connections. The use of electrical tape for splices and connections shall not be acceptable.

- F. Identify all wire and cable at terminations and at every junction box. Identification shall be made with an approved permanent label, or equal.
- G. Furnish and install all SMS wire and cable except for traveling cable for elevator control and monitoring.
- H. Coordinate the protection and routing of wire and cable requiring isolation from power, radio frequency (RF), electromagnetic interference (EMI), telephone, etc. with the Architect.
- I. Run all wire and cable continuous from device location to the final point of termination. No mid-run cable splices shall be allowed.
- J. Wire and cable within ICs, power distribution cabinets and other security enclosures shall be neatly installed, completely terminated, pulled tight with slack removed and routed in such a way as to allow direct, unimpeded access to the equipment within the enclosure. All wire and cable shall be bundled and tied.
- K. Provide heat-shrink to insulate all wire splices and connections. The use of electrical tape for splices and connections shall not be acceptable.
- L. Visually inspect all wire and cable for faulty insulation prior to installation.
- M. Provide grommets and strain relief material where necessary to avoid abrasion of wire and excess tension on Wire and Cable.
- N. Make connections with solder-less devices, mechanically and electrically secured in accordance with the manufacturer's recommendations. Wire nuts shall not be an acceptable means of connecting wire and cable.
- O. Neatly bundle and wrap all horizontally run (above accessible ceilings and not within conduit) wire and cable at three-meter intervals. Provide supports as required. All supports shall be UL listed for the application.
 - 1. All System wiring within vertical riser shafts (as required) shall be bundled, wrapped, and tied to the structure at three-meter intervals in order to isolate it from other wire and cable within the shaft. Additionally, all wire and cable within the shaft shall be supported at least every two floors. Provide all personnel and equipment necessary to install and support the cable. All equipment shall be UL listed for the application.

3.9 CONDUIT AND RACEWAY INSTALLATION

- A. Design, lay-out, size and plan new conduit and raceway systems as required.
- B. Cabling shall be installed in conduit under any of the following conditions:
 - 1. Where required by code
 - 2. Where cabling traverses unsecure, public space
 - 3. Where cabling would otherwise be exposed to tampering or vandalism.
- C. No exposed conduit shall be installed within public areas unless approved by Architect.

D. Indoor Requirements:

1. Route exposed conduit and raceway parallel and perpendicular to walls and adjacent piping.
2. Group conduit in parallel runs where practical and use conduit rack constructed of steel channel with conduit straps or clamps.
3. Use conduit bodies to make sharp changes in direction, as around beams. Fasten conduits and raceways to structural steel using approved spring clips or clamps.
4. Where conduit penetrates fire-rated walls and floors, seal opening with UL listed fire rated sealer or other methods as approved by codes.
5. No exposed conduit, raceway, or junction box shall be installed within any office area.
6. Install all boxes straight and plumb.
7. Do not support conduit from mechanical, plumbing, or fire sprinkler systems.
8. Drill or core drill all holes in walls, ceilings, or floors where required for new conduits. Do not cause damage to any structural steel or other structural support member by drilling or cutting.
9. Do not use flexible conduit in lengths longer than six (6) feet

E. Outdoor Requirements:

1. In locations where conduit penetrates exterior walls, seal opening around conduit in an approved manner to make watertight.
2. Use galvanized straps and fasteners on all exterior conduits.
3. All exterior boxes will only be used to aid in pulling the cable between points.

3.10 PENETRATIONS

- A. Do not penetrate any roof, flashing, exterior wall, or parapet without prior approval from designated Construction Project representative.
- B. When penetrating a fire wall for passage of cables and/or conduit, always provide a fire-stop system that complies with code and the local authority having jurisdiction.

3.11 FIRE RATED DOORS AND FRAMES

- A. Do nothing to modify a UL-rated door or frame that would void the UL-label or fire rating.

3.12 GROUNDING

- A. Provide earth-grounding of equipment as required by equipment manufacturer. Earth ground shall be connected to ground rod or approved cold water pipe. Electrical or telephone ground connections shall not be used as earth grounds. Connections to mounting posts or building structural steel shall not be used as earth grounds.

3.13 POWER TO SECURITY EQUIPMENT

- A. Power all equipment from circuits dedicated for security use, except as noted. Mark all panel circuit breakers with labels worded "Security Equipment - Do Not Operate", or equivalent.
- B. All plug-in transformers shall be located at the security control panels. Secure all low-voltage plug-in transformers to outlet with screw or strap. Clearly label all transformers to identify purpose and use.

- C. AC power dedicated to security and on generator backup shall be provided for the Security System as indicated on the Documents. Coordinate with the Architect to establish locations of dedicated AC circuits.
- D. Connect to the AC power and provide UL listed power supplies and transformers to distribute low voltage power to the System components as required.
- E. Provide hinged cover terminal cabinets with tamper switches for all power supplies, transformers, and power distribution terminal strips. Provide all conduit and wiring from the AC power facilities to the terminal cabinets.
- F. Surge Protection:
 - 1. Provide protection against spikes, surges, noise, and other line problems for all System equipment and components.
 - a. Protect all exterior video, control, power, signal cables and conductors against power surges. Video surge protectors shall not attenuate or reduce video and sync signals under normal conditions. Each surge protector shall be UL Listed.

3.14 CUTTING AND PATCHING

- A. The Contractor shall be responsible for all cutting, fitting, or patching that may be required to complete the Work.

3.15 PAINTING

- A. All surface raceway systems shall be painted to match the surfaces they are attached to:

3.16 PLYWOOD BACKING

- A. Install the processor(s), power supplies, and all other related equipment on a plywood backboard for testing in the shop. The mounted assembly will then be transported "as is" to the job site for mounting in the Communication Room.
- B. Fasten the plywood backing to the wall using a hanger bolt at the four corners which align with pre-drilled holes in the plywood. Secure with flat washers and a nut.

3.17 CLEANING

- A. During construction, and prior to acceptance of the building, remove from the premises and dispose of packing material and debris caused by electronic security work.
- B. Remove dust and debris from interiors and exteriors of electrical equipment. Clean accessible current carrying elements prior to being energized.

3.18 MANUFACTURER PROFESSIONAL SERVICES

- A. Contractor shall coordinate with the manufacturer to provide the manufacturer's professional services team to assist in coordinating the interfaces between the security management system and other on-site systems as necessary.

- B. Professional Services personnel shall be employed by the manufacturer of the security management system and shall be thoroughly knowledgeable of the security management system applications.
- C. Professional Services personnel shall be on-site and available to meet for a period of not less than two consecutive days.

3.19 SYSTEM START-UP

- A. The Work shall be complete and ready to operate prior to final acceptance.
- B. Load the entire initial user database into all programmable systems up to the day of beneficial use of the system. The Architect shall assist in establishing procedural guidelines and in defining terminology and conditions unique to the Owner's operation.

3.20 SYSTEM ACCEPTANCE

- A. Final acceptance testing of the Work will be conducted by the Architect, Consultant, and/or Owner.
- B. Prior to any final acceptance testing, the Contractor shall submit two (2) sets of preliminary Record Drawings to the Architect. The preliminary Record Drawings are to be used by the Architect to conduct the system final test.
- C. The Contractor shall submit a report matrix indicating completion or delinquency for each item included in the Specification and all subsequent addenda and bulletins as part of the Work. Should work on any item be under way, but not yet fully complete, indicate the extent (or lack thereof) of completion to date, and the proposed date of completion.
- D. Conduct a complete test of the entire system and provide the Architect with a written report on the results of that test. During this test, place the integrated system in service and calibrate and test all equipment.
- E. Fully complete a Security Systems Readiness Checklist prior to the test of the system. The checklist shall accompany the written certification to the Architect that the installed complete system has been calibrated, tested, and is fully functional as specified herein.
- F. Following completion of the initial testing and correction of any noted deficiencies, conduct a five (5) day burn-in test. The intent of the burn-in test shall be to prove the system by placing it in near real operating conditions. During this period the system shall be fully functional and programmed such that all points, interfaces, controls, reports, messages, prompts, etc. can be exercised and validated. Record and correct any system anomaly, deficiency, or failure noted during this period. Scheduling of the final acceptance test shall be based on a review of the results of this burn-in test.
- G. Deliver a report describing the results of functional tests, burn-in tests, diagnostics, calibrations, corrections, and repairs including written certification to the Architect that the installed complete system has been calibrated, tested, and are fully functional as specified herein.

- H. Prior to the final acceptance test, coordinate with the Architect for security related construction clean-up requirements. Security equipment closets and similar areas should be free of accumulation of waste materials or rubbish caused by operations under the Contract. At completion of the Work, remove all waste materials, rubbish, the Contractor's and its subcontractors' tools, construction equipment, machinery, and all surplus materials.
- I. Upon written notification from the Contractor that the system is completely installed, integrated, and operational, and the burn-in testing completed, the Consultant will conduct a final acceptance test of the entire system.
- J. During the final acceptance test by the Consultant, the Contractor shall be responsible for demonstrating that, without exception, the completed and integrated system complies with the contract requirements. All physical and functional requirements of the project shall be demonstrated and shown. This demonstration will begin by comparing "as built" conditions of the system to requirements outlined in the Specification, item by item. Following the Specification compliance review, all system head-end equipment will be evaluated.
- K. To sufficiently demonstrate the system's functionality, the console operator on duty and his/her superior may be requested to perform certain daily operations inherent to the system.
 - 1. As all these operations depend heavily on the training outlined within the Specification, the Contractor shall have completed all of the required training prior to initiation of the final acceptance test.
- L. The functionality of all interfaces between systems will be tested.
- M. Following the system head-end equipment and console review, the installation of all field devices will be inspected. Areas examined will include general neatness and quality of installations, complete functionality of each individual device, and mounting, back box and conduit requirements compliance.
- N. All equipment shall be fully operational during testing procedures. The Contractor shall provide all personnel, equipment, and supplies necessary to perform all site testing. A minimum of two (2) employees familiar with the system for the final acceptance test shall be present during the testing. One employee shall be responsible for monitoring and verifying alarms while the other will be required to demonstrate the function of each device. Supply at least two (2) two-way radios for use during the test. A manufacturer's representative may be present on site to answer any questions that may be beyond the technical capability of the Contractor's employees, if the Contractor so elects or by specific request of the Architect or Owner, at no charge to the Architect or Owner.
- O. Upon successful completion of the final acceptance test (or subsequent punch list retest) the Consultant will issue a letter of final acceptance.
- P. The Consultant retains the right to suspend and/or terminate testing at any time when the system fails to perform as specified. If it becomes necessary to suspend the test, all of the Owner's/Architect's fees and expenses related to the suspended test will be deducted from the Contractor's retainage. Furthermore, in the event it becomes necessary to suspend the test, the Contractor shall work diligently to complete/repair all outstanding items to the condition specified in Documents. The Contractor shall supply the Consultant with a detailed completion schedule outlining phase-by-phase completion dates and a tentative date for a subsequent

punch list retest. During the final acceptance test, no adjustments, repairs, or modifications to the system will be conducted without the permission of the Consultant.

3.21 RECORD DOCUMENTATION

A. Operation and Maintenance Manuals:

1. Operation and Maintenance Manuals shall apply to all security related devices, equipment, and software modules.
2. Operation and Maintenance Manuals shall be formatted as follows:
 - a. Identify each manual's contents on the cover.
 - b. Provide a table of contents and tabulated sheets for each manual. Place tab sheets at the beginning of each chapter or section and at the beginning of each appendix if applicable.
 - c. Any hardware manual demonstrating more than one model number of device on any one page shall be clearly marked as to delineate which model has been implemented in the Work.
3. Operation and Maintenance Manuals shall include, at a minimum, the following:
 - a. Operational description of each subsystem
 - b. Detailed programming descriptions for each subsystem
 - c. Explanations of subsystem interrelationships
 - d. Electrical schematics for each piece of equipment specified
 - e. Power-up and power-down procedures for each subsystem
 - f. Description of all diagnostic procedures
 - g. A menu tree for each subsystem
 - h. Setup procedures for each component of the subsystems
 - i. A list of manufacturers, their local representatives, and subcontractors that have performed Work on the Project
 - j. Installation and service manuals for each piece of equipment
 - k. Maintenance schedules for all installed components.
4. Operation and Maintenance Manuals shall include a separate section for each software program incorporated into the Project. The software section shall include, at a minimum, the following information:
 - a. Definitions of all software related terms and functions
 - b. Description of required sequences
 - c. Directory of all disk files
 - d. Description of all communications protocols, including data formats, command characters, and a sample of each type of data transfer
 - e. Instructions for manufacturer supplied report generation
 - f. Instructions for custom report generation
 - g. Database format and data entry requirements.

B. Procedure for Resubmitting:

1. Make corrections or changes as required by the Architect and resubmit when the Architect's stamp requires re-submittal.
2. Clearly identify changes made other than those specifically requested by the Architect when resubmitting Record Drawings. Changes shall be clouded or similarly highlighted as coordinated with the Architect. Only changes that have been specifically requested by the Architect or have been clouded by the Contractor will be reviewed on resubmittals.
3. Any drawing sheets added to the resubmittal shall be clearly identified and clouded and shall not change the sheet numbering scheme for previously issued Record Drawings.

4. The Contractor shall be responsible for any delays caused by the re-submittal process.
5. Re-submittal Review Fees:
 - a. If the Architect rejects the Contractor's Record Submittal (Rejected, Revise, and Resubmit) more than two times, the Architect will be compensated for all subsequent reviews, whether partial or comprehensive. The amount of such compensation will be incorporated by Change Order and withheld from the Contractor's Application for Payment.

3.22 TRAINING

- A. Contractor shall provide complete operator training on the security system. Hands-on training shall include the opportunity for each person to operate the system, and to practice each operation that an operator would be expected to perform
- B. Training shall cover all operating features of the system for access control, video surveillance and enrolling user credentials.
- C. Provide a minimum of 40 hours of VSS System operator training, and 40 hours of ACS administrative training, either on or off site on a complete and fully operational System parallel and equal to the System being provided, to representatives of the Owner.
- D. Operator training shall include, but not be limited to the following:
 1. All system operation procedures.
 2. System configuration
 3. Alarm acknowledgement, alarm response logging and map graphics functionality.
 4. Manual and automatic camera call-up procedures
 5. Video matrix functionality
 6. NVR functionality
- E. Administrative training shall include, but not be limited to the following:
 1. System operation and configuration variables
 2. Manual and automatic camera call-up procedures
 3. Video Wall set up, configuration variables, and functionality
 4. Recording set up, configuration variables, and functionality
 5. Video playback functionality.
 6. Report generation, manual and scheduled.
 7. Card holder input and deletion
 8. Visitor Management system and operation of all system procedures

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SECTION 28 05 13

ELECTRONIC SECURITY CONDUCTORS AND CABLING

PART 1 - GENERAL

1.1 GENERAL REQUIREMENTS

- A. Applicable requirements of Division 01 - General Requirements and Division 28, Section 28 00 00 shall be considered a part of this section and shall have the same force as if printed herein full.
- B. The work to be done under this section of the Specifications shall include the furnishing of labor, material, equipment, and tools required for the complete installation of the work indicated on the Drawings, as specified herein, or as noted in other sections of Division 28 – Electronic Safety and Security.
- C. All materials, obviously a part of the electronic security infrastructure and necessary to its proper operation, but not specifically mentioned or shown on the Drawings, shall be furnished, and installed without additional charge.
- D. The Drawings and Specifications are complementary to each other and what is called for by one shall be as binding as if called for by both. If a discrepancy exists between the Drawings and Specifications, the higher cost and/or higher level of functionality shall be included to meet the design intent.
- E. Work and products provided must conform to the State of Delaware's Building Access Security Standard, SE-ACCESS-001. This standard as authorized by Delaware Law, Title 29, Chapter 90C mandates the use of specific technology and products to establish consistency in both quality and the security as well as interoperability.
- F. The security contractors must be an approved vendor with the Delaware Department of Technologies & Information (DTI) and currently certified on all security related systems. Submittals/work shall be restricted to vendors have met the minimum requirements and are listed as a security vendor by the manufacturers and approved by the Owner or their authorized representative. The work detailed in these specifications and associated drawings are an expansion of the Owner's existing Security Management System (SMS). The products utilized on this project must be fully and completely compatible and supported by the Owner's existing SMS with no exceptions.

1.2 RELATED SECTIONS

- A. 28 00 00 Electronic Safety and Security

1.3 WORK INCLUDED

- A. The scope of work for this project shall include infrastructure and devices for the security systems, which shall include cabling, 120VAC power (Div 26), back boxes, and conduit. Security devices and the installation of the systems will be furnished and installed by the contractor. Refer to electrical specifications for installation of the electrical requirements.

B. The work shall consist of turnkey system comprised of these core systems:

1. Access Control System
2. Security Communication Systems
3. Video Surveillance System
4. Wire and cable to install all equipment as specified herein
5. Miscellaneous conduit, power supplies, and back boxes (not shown on the Documents as provided, but required for a complete installation)

PART 2 - PRODUCTS

2.1 GENERAL

- A. All products not provided by the end-user shall be new and unused and shall be of manufacturers' current and standard production.
- B. Where two or more equipment items of the same kind are provided, all shall be identical and provided by the same manufacturer.
- C. Drawings and Specifications indicate major system components, and may not show every component, connector, module, or accessory that may be required to support the operation specified. Contractor shall provide all components needed for complete and satisfactory and intended operation.
- D. Product Availability
1. Contractor, prior to submitting a proposal, shall determine product availability and delivery time, and shall include such considerations into his proposed Contract Time.
 2. Certain products specified may only be available through factory authorized dealers and distributors. Contractor shall verify his ability to procure the products specified prior to submitting a proposal.
- E. Wire and Cable
1. General: Provide all wire and cable required to install systems as indicated. Wire and cable shall be sized to provide minimum voltage drop and minimum resistance to the devices being supplied.
 2. All cables shall be specifically designed for their intended use (direct burial, aerial, etc.).
 3. Comply with equipment manufacturers recommendations for wire and cable size and type.
 4. Comply with all applicable codes and ordinances.
- F. Conduit and Raceway Systems
1. General: The placing of surface mounted conduit on the exterior of any building shall be approved by end-user prior to its installation.
 2. Interior Conduit:
 - a. Electrical Metallic Tubing (EMT)

- b. Flexible Metal Conduit
 - c. Provide fittings and connectors as required for installation of EMT or flexible conduit.
- 3. Surface Raceways: Sheet metal channel with fitted cover, suitable for use as surface metal raceway, WIREMOLD, or approved equal.
 - a. Provide fittings, elbows, and connectors designed for use with raceway system.
- 4. Exterior Conduit: (any of the following as determined by local code requirements):
 - a. Rigid Steel Conduit
 - b. Rigid Aluminum Conduit
 - c. Rigid Nonmetallic Conduit (only if buried 18" below ground surface).
 - d. Intermediate Metal Conduit
 - e. Provide rain-tight fittings and connectors as required for installation of exterior conduit.
- 5. Exterior Flexible Conduit:
 - a. Liquid-tight Flexible Conduit: Flexible metal conduit with PVC jacket.
 - b. Provide rain-tight fittings and connectors as required for installation of Liquid-tight Flexible Conduit.

G. Junction and Pull Boxes

- 1. Interior Boxes: Sheet Metal Outlet Boxes: Sizes to be determined in accordance with code requirements for conductor fill. Provide box covers as required.
- 2. Exterior Boxes: All exterior boxes shall NEMA 4 or NEMA 3R, water-tight and dust-tight
- 3. All interior and exterior boxes shall have their covers fastened using security screws.

H. Lightning Protection

- 1. The Contractor shall provide suitable lightning protection for all processors/controllers and exterior cameras mounted on roof.
- 2. All lightning protection equipment shall be UL listed.

2.2 WIRE AND CABLE

A. General Requirements:

- 1. Provide wire and cable as required to install the Security System as indicated on the Drawings and specified herein.
- 2. All wire and cable shall be Underwriter's Laboratories (UL) listed, and shall meet all national, state, and local code requirements for its application.
- 3. All wire and cable shall meet individual system or subsystem manufacturer Specifications.
- 4. All wire and cable shall be Plenum type cable and shall conform to the minimum requirements of Insulated Cable Engineers Association (ICEA) Standards.

5. Wire and cable shall comply with the applicable requirements of the National Electrical Code (NEC), latest edition, in regard to cable construction and usage.
6. The conductors of wires shall be copper and have conductivity in accordance with the standardization rules of the Institute of Electrical and Electronics Engineers, Inc. (IEEE). The conductor and each strand shall be round and free of kinks and defects.
7. All cable carrying data or voice transmissions shall be shielded. All other cable shall be shielded where necessary for interference-free signals.
8. Insulation shall be rated for a minimum of 300V.
9. Color-coding shall be accomplished by using solidly colored insulation. Grounding conductors, where insulated, shall be colored solid green or identified with green color as required by the National Electric Code (NEC).

B. Wire Types and Sizes

1. The cabling listed here shall govern the basis of design for cabling to all devices. The installing contractor is responsible for providing a full wiring solution for a fully operational systems and submit wiring types for approval based on a devices requirement. This shall be documented as part of the submitting contractors shop drawings and submittals for approval.
2. Signal Cable (Non-Power): Wire size shall be a minimum of 20 AWG, twisted, shielded, stranded, insulated, and jacketed.
3. Signal Cable (Low Voltage Power): Wire size shall be a minimum of 18 AWG, stranded, insulated, and jacketed.
 - a. Wire size shall be a minimum of 18 AWG, twisted, stranded, insulated, and jacketed and shall be used for cable runs less than 500 feet.
 - b. Wire size shall be a minimum of 16 AWG, twisted, stranded, insulated, and jacketed and shall be used for cable runs in excess of 500 feet, but less than 750 feet.
 - c. Wire size shall be a minimum of 14 AWG, twisted, stranded, insulated, and jacketed and shall be used for cable runs in excess of 750 feet, but less than 1,250 feet.
4. Security IP Network Cabling
 - a. Shall be provided by the Telecommunications Contractor under Division 28.
 - b. Shall consist of (4) twisted pairs, 24 AWG or greater.
 - c. Shall be Category 6 Augmented cabling (CAT 6A).
 - d. Refer to Div-27 Communications Specifications.
5. IP Network Patch Cables for Security Equipment
 - a. Security Contractor shall provide patch cables for network connectivity within Security Equipment Rooms and where necessary in order to complete the Security System Work.
 - b. Shall consist of (4) twisted pairs, 24 AWG or greater.
 - c. Shall be Category 6 Augmented cabling (CAT 6A).
6. Composite Cable for Door Devices

- a. Composite cable shall contain the following cable types: 22 AWG 6 Conductor (QTY 1), 22 AWG 2 Conductor (QTY 1), 22 AWG 4 Conductor (QTY 1), 18 AWG 2 Conductor (QTY 1)
 - b. Acceptable Manufacture: Belden 658AFS, or approved equal
7. Card Reader, Single Cable
 - a. Cable shall be a 22 AWG 6 Conductor
 - b. Acceptable Manufacture: West Penn 253270B, or approved equal
8. Electric Lock Cable
 - a. Cable shall be an 18AWG 2 Conductor
 - b. Acceptable Manufacture: West Penn 25224B, or approved equal
9. Door Contact Cable / Duress Button
 - a. Cable Shall be an 22AWG 4 Conductor.
 - b. Acceptable Manufacture: Belden 6302FE, or approved equal
10. Request to Exit or Accessory Cable
 - a. Cable Shall be and 18AWG 4 Conductor
 - b. Acceptable Manufacture: Belden 6302FE, or approved equal
11. RS-485 Cable
 - a. Cable Shall be and 22AWG 4 Pair
 - b. Acceptable Manufacture: Belden 3109A, or approved equal
12. Turnstile Cable (By Manufacture)
13. Local Alarm Cable (Shall be based on model approved/submitted)

PART 3 - EXECUTION

3.1 GENERAL

- A. Provide necessary work as detailed on Section 28 00 00.

3.2 SITE INSPECTIONS

- A. Continuously verify that the site conditions agree with the Documents and the design package. Submit a report to the Architect documenting changes to the site or conditions that affect the 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. No deficiency shall be corrected without written permission from the Architect.
- B. Specific mounting locations, exact wire and cable runs, and conduit routing have not been specified or delineated on the Documents. Coordinate all aspects of the Work with the Architect.

3.3 COORDINATION

- A. Coordinate with the Architect to ensure that adequate conduit is provided, and that equipment back-boxes are adequate for System installation.
- B. Coordinate with the Architect to ensure that adequate power has been provided and properly located for the security System equipment.
- C. Coordinate with the Architect to ensure that doors and doorframes are properly prepared for electric locking hardware and door position switches.
- D. Coordinate locations of all devices with the Architect prior to installation.
- E. Coordinate and verify the location of each piece of rack-mounted equipment with the Owner.

3.4 EQUIPMENT

- A. Provide equipment as indicated on the Documents and specified herein. Additional specific installation requirements are as follows:
 - 1. Security Equipment Room and IC Locations
 - a. Configure security equipment as indicated in the Documents.
 - b. Wire all power supply power fail alarm contacts in each equipment room as a single alarm input to the SMS.
 - c. Wire each power supply low battery alarm contact as individual alarm inputs to the SMS.
 - 2. Controllers
 - a. Configure the System such that devices can be connected to spare input points, output points and card reader inputs on the controller without requiring reconfiguration of the system.
 - 3. Card Readers
 - a. Wire card reader LEDs to indicate valid and invalid card reads, and door locked and unlocked conditions. All card reader LED indicators shall operate identically.
 - 4. Electric Locking Mechanisms
 - a. Interface with electric locking mechanisms provided by the door hardware supplier.
 - b. Wire electric locking mechanisms as indicated on the Documents.
 - c. Wire fail-safe electric locking mechanisms in accordance with local codes.
 - d. Wire fail-secure electric locking mechanisms and power supplies such that a fire alarm condition or building power failure shall not affect operation of the lock.
 - 5. Delayed Egress Locking Devices
 - a. Interface with delayed egress locking devices provided by the door hardware supplier.
 - b. Wire delayed egress locking devices as indicated on the Documents.

- c. Wire delayed egress locking devices for fail-safe operation in accordance with local codes.
 - d. Interface with a normally closed alarm contacts that shall open upon activation of the unlock timer.
 - e. Interface with sounder bypass control contacts. Wire control output contacts to bypass sounder by system workstation.
 - f. Interface with lock control contacts activated by system workstation and/or time schedule. Wire control output contacts to lock/unlock devices by time schedule and/or system workstation.
6. Fire Alarm Interface
- a. Connect (hard wire) fail-safe electric and time delay locking mechanical to the building fire alarm System for fail-safe release upon any fire alarm.
 - b. Interface with a single low voltage/low current normally closed dry contact from the fire alarm System provided by the fire alarm contractor in the Fire Command Center. The contact shall open on any fire alarm condition.
 - c. Provide all additional UL listed fail-safe relays and power supplies necessary to interface to this contact and unlock all fail-safe doors.
 - d. Connect fail-safe relays and power supplies to standard building power. Connection of fail-safe devices to emergency or UPS power shall not be acceptable.
 - e. Reference the Documents for fire alarm interface requirements.

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SECTION 28 13 26

ACCESS CONTROL FIELD DEVICES

PART 1 - GENERAL

1.1 GENERAL REQUIREMENTS

- A. Applicable requirements of Division 01 - General Requirements and Division 28, Section 28 00 00 shall be considered a part of this section and shall have the same force as if printed herein full.
- B. The work to be done under this section of the Specifications shall include the furnishing of labor, material, equipment, and tools required for the complete installation of the work indicated on the Drawings, as specified herein, or as noted in other sections of Division 28 – Electronic Safety and Security.
- C. All materials, obviously a part of the electronic security infrastructure and necessary to its proper operation, but not specifically mentioned or shown on the Drawings, shall be furnished, and installed without additional charge.
- D. The Drawings and Specifications are complementary to each other and what is called for by one shall be as binding as if called for by both. If a discrepancy exists between the Drawings and Specifications, the higher cost and/or higher level of functionality shall be included to meet the design intent.
- E. Work and products provided must conform to the State of Delaware's Building Access Security Standard, SE-ACCESS-001. This standard as authorized by Delaware Law, Title 29, Chapter 90C mandates the use of specific technology and products to establish consistency in both quality and the security as well as interoperability.
- F. The security contractors must be an approved vendor with the Delaware Department of Technologies & Information (DTI) and currently certified on all security related systems. Submittals/work shall be restricted to vendors have met the minimum requirements and are listed as a security vendor by the manufacturers and approved by the Owner or their authorized representatives. The work detailed in these specifications and associated drawings are an expansion of the Owner's existing Security Management System (SMS). The products utilized on this project must be fully and completely compatible and supported by the Owner's existing SMS with no exceptions.

1.2 RELATED SECTIONS

- A. 28 00 00 Electronic Safety and Security

1.3 WORK INCLUDED

- A. The work shall consist of turnkey system comprised of these core systems:
 - 1. Access Control System
 - 2. Security Communication Systems
 - 3. Video Surveillance System

4. Wire and cable to install all equipment as specified herein.
5. Miscellaneous conduit, power supplies, and back boxes (not shown on the Documents as provided, but required for a complete installation)

1.4 SYSTEM DESCRIPTION

- A. The scope of work to be included in this contract does not necessarily include every item of work. The Contractor shall supply and install items that meet the specified requirements of the construction documents.
- B. The project shall be a new turnkey site with a Honeywell Enterprise Pro-Watch Security Management System (SMS) that shall be seamlessly integrated into the Statewide system.
- C. The access control field devices shall be furnished complete, installed, programmed, tested, and operational with the State and sites SMS. All new security IP devices shall be terminated to the dedicated security network.
- D. Components:
 1. The Contractor shall provide access control equipment as specified herein including but not limited to the following:
 - a. Access control and alarm monitoring controller(s)
 - b. Credential reader(s)
 - c. Door position sensor(s)
 - d. Door prop alarm(s)
 - e. Enclosures
 - f. Power supplies
 - g. Software modules required for specification operation/expansion.

PART 2 - ACCESS CONTROL FIELD DEVICES

2.1 GENERAL

- A. All products not provided by the end-user shall be new and unused and shall be of manufacturers' current and standard production.
- B. Where two or more equipment items of the same kind are provided, all shall be identical and provided by the same manufacturer.
- C. The access control reader protocol shall leverage OSDP communications. Contractor ensures all systems end devices are fully compatible with this communication protocol.
- D. Drawings and Specifications indicate major system components, and may not show every component, connector, module, or accessory that may be required to support the operation specified. Contractor shall provide all components needed for complete and fully functional system.

- E. The security management system shall be equipped with access control field hardware required to receive alarms and administer all access granted/denied decisions. All field hardware shall meet UL requirements.
- F. Product Availability:
 - 1. Contractor, prior to submitting a proposal, shall determine product availability and delivery time, and shall include such considerations into his proposed Contract Time.
 - 2. Certain products specified may only be available through factory authorized dealers and distributors. Contractor shall verify his ability to procure the products specified prior to submitting a proposal.

2.2 ACCESS CONTROL GENERAL

- A. The project shall be an expansion of the existing Honeywell Enterprise Pro-Watch Security Management System (SMS) for the state.
- B. Acceptable Manufacturer:
 - 1. Honeywell Corporation – Pro-Watch, no exceptions

2.3 ACCESS CONTROL PANEL (ACP) IP CONTROLLER

- A. The IP controller shall be an Ethernet ready, fault tolerant host communication capable for the efficient management of network of access panels.
 - 1. The IP controller shall use an RS-232, 2-wire RS-485 or Ethernet link to connect to a Windows or Linux host. The intelligent controller shall be capable of elaborate processes and procedures without host intervention. Once configured, the intelligent controller shall function independently of the host, and shall be capable of controlling access, managing alarms, interfacing with an array of hardware devices, all while providing the decision-making oversight that each system configuration requires.
 - 2. The IP controller module shall provide end to end encryption to each IP distributed sub control modules and the Pro-Watch SMS system.
- B. Acceptable Manufacturer:
 - 1. Honeywell PW7000-Series PW7K1IC, no exceptions

2.4 READER INTERFACE MODULE

- A. The intelligent controller shall provide decision making, event reporting, and database storage for hardware platform.
- B. Two reader interfaces shall provide control for two door and the ACP can support up to 64 doors in paired and or alternate reader configurations with peripheral interface devices.
- C. Acceptable Manufacturer:

1. Honeywell PWK1R2, no exceptions

2.5 INPUT CONTROLLER MODULE

- A. The peripheral interface device shall be used to monitor sixteen (16) inputs.
- B. Acceptable Manufacturer:

1. Honeywell PW7K1IN no exceptions

2.6 OUTPUT CONTROLLER MODULE

- A. The peripheral interface device shall be used to provide sixteen (16) dry contact outputs to auxiliary equipment such as locks or to activate alarms.
- B. Acceptable Manufacturer:

1. Honeywell PW7K1OUT no exceptions

2.7 POWER SUPPLY

- A. The access control panel power supply shall be dedicated to the access control system and shall not provide power for locks or any other low voltage device.

2.8 THE ACP POWER SUPPLIES SHALL PROVIDE THE FOLLOWING:

1. 120VAC 60Hz input voltage and provide filtered and conditioned output voltage as required.
2. Four (4) hours of battery backup to provide continuous operation during power failure.
3. A battery charger to maintain the battery.
4. Low battery and power fail contacts to monitor the status of the input power and the battery.
5. Each Power Supply shall be housed in a locking steel enclosure designed for surface mounting. The housing shall include a tamper switch to sense the removal or opening of the enclosure cover. All power supplies, ACPs, and power distribution cabinets shall be keyed alike.

- B. Acceptable Manufacturer:

1. Altronix or as per the manufacturer's recommendations and/or specifications.

2.9 ACCESS CONTROL CREDENTIAL READERS

- A. The card reader shall be proximity technology and shall read encoded data from access cards and transmit the data to the ICs. The operating frequency shall meet all local regulations.

- B. A two-color LED on the face of the card reader and an audible tone shall indicate authorized and unauthorized reader uses.
- C. No system compromise shall be possible from circuitry located in the reader unit.
- D. The card reader shall have provision to operate as specified in environments of electromagnetic and radio frequency interference as well as spurious electrical line interference. When installed according to manufacturer's instructions the reader shall operate properly when mounted adjacent to or directly on any material including metal without the use of standoff or space.
- E. Provide manufacturer recommended power to each card reader directly from the IC or a secondary supply. The power supply shall be a linear UL Class 2, power limited and shall provide necessary output voltage to allow the card reader to operate at its maximum specified read range.
- F. Reader communication protocol shall provide full duplex HID pivCLASS protocol and CoreStreet Half Duplex OSDP.
- G. Readers shall be pivCLASS and FIPS 201 complaint. FIPS complaint readers are limited to standard read range, no long reader options are available.
- H. Acceptable Manufacturer:
 - 1. HID RK40-H proximity reader, no exceptions
 - 2. HID RPK40-H proximity and keypad reader, no exceptions

2.10 ACCESS CONTROL CREDENTIALS

- A. The owner shall control, issue, and provide FIPS access control credentials as required for this project.

2.11 ELECTRIFIED LOCKING MECHANISMS

- A. Shall be provided under the door hardware division 08 71 00 Specification.
- B. The security system shall interface with electrified locking mechanisms as indicated on the Documents.
- C. Provide fail-safe operation of electrified locking mechanisms as required by local codes.
- D. Fail-secure locks shall remain operational during a fire alarm condition or power failure.

2.12 ELECTRIFIED LOCKING MECHANISM POWER SUPPLY

- A. Provide power supplies for all electric locking mechanisms as specified except for those noted as having time-delay functions as defined by NFPA 101.
- B. Power supplies for time-delay function locks shall be provided by others. Coordinate with others as necessary to ensure proper operation of all time-delay electric locking mechanisms to include the provision of, and final termination of, system control and monitoring wire and cable as necessary to facilitate desired operation and integration with the system.

- C. Provide power supplies for all electric locking mechanisms (except for fire stair doors). Fail-safe locking devices shall unlock automatically under the following conditions:
 - 1. Any building fire alarm
 - 2. Loss of building power
 - 3. Failure of the power supply
- D. Provide battery chargers and batteries sufficient for four (4) hours of backup power for the connected load for all power supplies except those for fail-safe locks.
- E. Monitor low battery and power fail alarms for each power supply.
- F. Minimum Specifications:
 - 1. Type: UL Listed Class II power limited
 - 2. Input Voltage: 120VAC 60 Hz
 - 3. Output Voltage: 24 VDC
 - 4. Output Connections: Individually thermal fused outputs to each lock
 - 5. Output Rating: 150% of actual connected load
 - 6. Battery: Sealed gel type
 - 7. Alarm Outputs: Low battery and power fail
 - 8. Enclosure: Steel enclosure with integral lock and tamper switch.
- G. Acceptable Manufacturer: Altronix AL600ULACMCB Series (Trove Integrated), Lifesafety Power (FlexPower Integrated).

2.13 DOOR POSITION SWITCHES

- A. Concealed Door Position Switch:
 - 1. Minimum Specifications:
 - a. Gap: 1" (25mm)
 - b. Switch Type: SPST
 - c. Mounting: 1" (25mm) diameter hole in door and frame
 - d. Contractor shall choose the proper color to match the décor.
 - e. The contact shall provide a SPDT switch with an open or closed loop where required for functionality and operational needs.
 - f. All recessed switch sets shall be treated with a thin coat of RTV silicone to isolate and reduce vibration transfers from building structure.
 - 2. Acceptable Manufacturer:
 - a. Magnasphere MSS-19C or approved equal.
- B. Surface Mount Door Position Switch:
 - 1. Minimum Specifications:
 - a. Gap: 3/4" (19mm)
 - b. Switch Type: SPST

- c. Contact covers shall conceal screws and terminal connections for finished look.
 - d. Provide armored cable, or other protection, from the switch location to the associated junction box to conceal the wire.
 - e. The switch shall be a hermetically sealed reed switch designed for surface mounting.
 - f. Contractor shall choose the proper color to match the décor.
 - g. The switch and magnet shall be contained in matching sealed housings.
 - h. When possible armored cable shall be use and secured at the junction box utilizing a compression type fitting.
 - i. Excess armor shall be trimmed within the junction box.
 - j. Armored cable between the junction box and the door contact shall be secured using metal straps and screws or rivets as permanent fasteners. The magnetic contact terminal connections shall be so designed to restrict physical access when the unit is mounted.
 - k. Any utilization of contacts with exposed terminal screws is prohibited.
 - l. The utilization of concealed terminals is authorized only when the terminals are secured behind the contact mounting as part of the installation.
 - m. Terminal covers and similar concealment devices or techniques are prohibited.
 - n. All forms of self-adhesive fasteners are prohibited.
2. Acceptable Manufacturer:
- a. Magnasphere MSS-HS-L1.5 or approved equal.
- C. Tamper Switch:
1. Minimum Specifications:
- a. Type: Plunger with adjustable screw head
 - b. Gap: .06" to .1" (1.6mm to 2.6mm)
 - c. Switch Type: SPST
 - d. Provide normally closed tamper switches to monitor the secure status of all access control panel, power supplies, and power distribution units.
 - e. Mounting: Within cabinet with no outside access to fasteners.
2. Acceptable Manufacturer:
- a. Bosch ISN-CAS or approved equal.
- D. Overhead/Lift Closed Loop Magnetic Door Contact
1. The Minimum Specifications:
- a. Gap: 2" when installed
 - b. Switch Type: SPST
 - c. The overhead/lift door magnetic contact shall be specifically manufactured of aluminum bar stock. Flex stainless steel armored cable shall be permanently attached to the switch.
 - d. A manufacturer recommended mounting bracket shall be provided for mounting of the switch.

- e. The contact shall be a closed loop type as dictated by the location. The armored cable shall be secured at the junction box utilizing a compression type fitting.
- f. Excess armor shall be trimmed within the junction box. Armored cable between the junction box and the door contact shall be secured using metal straps and screws or rivets as permanent fasteners.
- g. Self-adhesive fasteners are prohibited.
- h. The switch, magnet and any brackets shall be secured to the mounting surface utilizing Torx-post type security screws.
- i. Mounting screws shall be treated with a thread-locking compound.

2. Acceptable Manufacturers:

- a. USP, Honeywell, GE or approved equal.

2.14 HARDWARE ENCLOSURE

- A. Enclosures shall be heavy-gauge, galvanized steel, dead-front construction with keyed, lockable panel cover type.
- B. Enclosures, panel covers, and trim rings shall be of surface, semi-flush, or flush-mounted design type, black in color, and assembled with tamper-proof screws. Panel shall be surface mounted when installed in non-public spaces such as mechanical rooms, electrical rooms, and closets. Panel shall be flush mounted when installed in public spaces such as lobbies and corridors and should have tamper switches on the enclosure wired to the cabinet tamper inputs on the controller board.
- C. Enclosure shall be equipped with tamper switches.
- D. Provide all necessary backup batteries.
- E. Manufacturer: Unified Enclosure Altronix Trove, LifeSafty Power FlexPower

2.15 CARD READER/INTERCOM PEDESTALS

- A. Provide and seamlessly integrate the proximity card readers/intercoms into pedestal mounts at each vehicle and pedestrian entry/exits as indicated within the project documents.
- B. Provide 24/7 tamper switch monitoring for each mounting card reader/intercom pedestal faceplate.
- C. Provide 24/7 tamper switch monitoring for each electrified gate override control panel access door/plate.

2.16 DOOR PROP ALARM WITH VOICE PROMPT (DPA)

- D. Provide DPA for local monitoring of doors and voice annunciations to prompt user to resecure the opening as indicated on the Documents.
- E. The DPA units provided shall be installed at a door to provide local (digital recorded voice) and remote (alarm contact) annunciation of "Door Prop/Door Held" or "Forced Door Violations".

The unit shall provide verbal messages to advise staff/public of a pending or actual "Door Held" violation as follows:

1. When the monitored door is held open longer than the field settable access period (adjustable from 0 sec. to 90 min.), the voice board issues a repeated Alarm Delay message such as "Please Close the Door" to inform the user of a pending security violation. If the door is closed at this time, the message is terminated. If the monitored door remains open beyond the Alarm Delay time period (adjustable from 0 sec. to 5 min) the voice board issues a repeated alarm message such as "Security violation, close the door". Upon issuance of the alarm message, the Voice Prompt DMA activates an alarm contact for remote indication of the "Door Prop/Door Held" violation.
2. This DMA shall also annunciate Forced Doors with a voice message and relay output.
3. Provide a thermal fused auto resetting power supply for unit operation.

F. Minimum Specification:

1. Inputs
 - a. N/O or N/C alarm shunt
 - b. N/C door contact
 - c. N/O remote rest/bypass
 - d. Voltage sense shunt
2. Outputs
 - a. N/O or N/C door position contact status
 - b. N/O or N/C door prop alarm status
 - c. N/O or N/C intrusion/tamper alarm status
 - d. N/O or N/C bypass/keyswitch status
3. Indicator
 - a. Integral LED for visual armed/bypass indication
4. Time Delay
 - a. Auto reset adjustable for 0-5 minutes or manual reset
 - b. Silent time adjustable for 0-90 seconds
 - c. Alarm delay adjustable for 0-5 Minutes or infinite.
5. Alarm
 - a. Field adjustable voice volume
 - b. Remote/aux speaker out at 8 Ohms
6. Mounting
 - a. Flush/Surface mount 2 gang, 3.5 deep electrical box
7. Bypass
 - a. Provide 1 1/8" Mortise cylinder bracket with maintained 2-position SPDT output key switch.
 - b. Mortise cylinder to be coordinated to obtain a tiered key format assigned to the tumbler and lock shop modified to match the site hardkey assigned.
8. Power
 - a. 12-24 VAC/VDC @ 500 mA.

G. Acceptable Manufacturer:

1. Designed Security Inc (DSI) ES4600-K1 or an approved equal

2.17 END-OF-LINE (EOL) RESISTOR

- A. The EoL resistor (EoL resistor pack) supervises the wiring between the control panel and the field device and is required for monitoring purposes for all devices in the system.
- B. If one detection device is on a single detection circuit, the EoL should be installed at the detection device.
- C. If more than one detection device is on a single detection circuit, the EoL should installed be at the last detection device in the loop.
- D. Do not install EoL resistors at the controller or panel location(s).
- E. The input circuit shall be monitored by EoL resistors to provide detection of the following four (4) states:
 1. Normal
 2. Alarm
 3. Open
 4. Short
 - a. The Contractor shall use the required EoL resistors particular for the system being furnished to provide the required four (4) state supervision.
- F. Acceptable Manufacturer:
 1. GRI 6644 EoL resistor pack or approved equal.

PART 3 - EXECUTION

3.1 GENERAL

- A. Provide necessary work as detailed in Section 28 00 00.

3.2 SITE INSPECTIONS

- A. Continuously verify that the site conditions agree with the Documents and the design package. Submit a report to the Architect documenting changes to the site or conditions that affect the 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. No deficiency shall be corrected without written permission from the Architect.
- B. Specific mounting locations, exact wire and cable runs, and conduit routing have not been specified or delineated on the Documents. Coordinate all aspects of the Work with the Architect.

3.3 COORDINATION

- A. Coordinate with the Architect to ensure that adequate conduit is provided, and that equipment back-boxes are adequate for system installation.
 - B. Coordinate with the Architect to ensure that adequate power has been provided and properly located for the security system equipment.
 - C. Coordinate with the Architect to ensure that doors and doorframes are properly prepared for electric locking hardware and door position switches.
 - D. Coordinate locations of all devices with the Architect prior to installation.
 - E. Coordinate and verify the location of each piece of rack-mounted equipment with the Owner.
 - F. Coordinate custom SMS report requirements with the Owner. Submit report formats to the Owner for review and acceptance.
 - G. Coordinate all initial database partitioning and setup with the Owner prior to initial programming and cardholder data entry.
 - H. Coordinate finishes and colors of all equipment with the Architect. Submit all finish and graphics for all equipment in public areas to the Architect for approval prior to installation.
- 1. Provide all expansion initial system programming and setup of the SMS including, but not limited to the following:
 - a. Graphical Maps and Icons: Coordinate with the Architect to obtain BIM or CAD architectural backgrounds for implementation as graphical maps. Import all AutoCAD background information provided by the Architect and produce a complete set of graphical maps depicting all SMS points.
 - b. SMS Card Reader Information: Coordinate all card reader values and text, including descriptors, alarm messages, camera call up, map call-up, and identification with the Architect.
 - c. Input and Output Points: Coordinate all input and output priorities and text, including descriptors, alarm messages, camera call up, and map call up and identification with the Architect.
 - d. Initial System Users and Levels of Access: This shall include the designation of an Owner's representative at the "Super User" level immediately upon SMS initialization.
 - e. Initial camera call-up and alarm information for interface with the VSS.
 - f. Initial camera call-up and alarm information for interface with the intercom system.
 - g. Alarm monitoring and automatic shutdown information for the UPS interface.

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SECTION 28 13 33

ACCESS CONTROL SYSTEM INTERFACES

PART 1 - GENERAL

1.1 GENERAL REQUIREMENTS

- A. Applicable requirements of Division 01 - General Requirements and Division 28, Section 28 00 00 shall be considered a part of this section and shall have the same force as if printed herein full.
- B. The work to be done under this section of the Specifications shall include the furnishing of labor, material, equipment, and tools required for the complete installation of the work indicated on the Drawings, as specified herein, or as noted in other sections of Division 28 – Electronic Safety and Security.
- C. All materials, obviously a part of the electronic security infrastructure and necessary to its proper operation, but not specifically mentioned or shown on the Drawings, shall be furnished, and installed without additional charge.
- D. The Drawings and Specifications are complementary to each other and what is called for by one shall be as binding as if called for by both. If a discrepancy exists between the Drawings and Specifications, the higher cost and/or higher level of functionality shall be included to meet the design intent.
- E. Work and products provided must conform to the State of Delaware's Building Access Security Standard, SE-ACCESS-001. This standard as authorized by Delaware Law, Title 29, Chapter 90C mandates the use of specific technology and products to establish consistency in both quality and the security as well as interoperability.
- F. The security contractors must be an approved vendor with the Delaware Department of Technologies & Information (DTI) and currently certified on all security related systems. Submittals/work shall be restricted to vendors have met the minimum requirements and are listed as a security vendor by the manufacturers and approved by the Owner or their authorized representatives. The work detailed in these specifications and associated drawings are an expansion of the Owner's existing Security Management System (SMS). The products utilized on this project must be fully and completely compatible and supported by the Owner's existing SMS with no exceptions.

1.2 RELATED SECTION

- A. 28 00 00 Electronic Safety and Security
- B. 09600 Flooring - Turnstile
- C. 16123 Electrical Supply and Termination - Turnstile

1.3 WORK INCLUDED

- A. The work shall include installation and commissioning of the following systems in compliance with the Owners security standards:

1. Provide, program, and seamlessly integrate all security subsystems into the Security Management System (SMS) and Control Center into the new site Security Operations Center (SOC).
2. Access Control Turnstile System
3. Access Control Elevator Control
4. Fire Alarm Interface for SMS
5. Security Equipment & Enclosures
6. Wire and cable to install all equipment as specified herein.
7. Miscellaneous conduit and back boxes (not shown on the Documents as provided but required for a complete installation).

1.4 SYSTEM DESCRIPTION

- A. The scope of work to be included in this contract does not necessarily include every item of work. The Contractor shall supply and install items that meet the specified requirements of the construction documents. The Security Management System (SMS) Servers and Workstations shall be furnished complete, installed, tested, and operational. The SMS is designed to secure the facility with the capability of expansion to and connection to the client network.
- B. All makes and models listed herein shall be superseded by the Owners security standards or directives.
- C. Components:
 1. The Contractor shall provide access control equipment as specified herein including but not limited to the following:
 - a. Power supplies.
 - b. Access control and alarm monitoring controller(s).
 - c. Intrusion detection system and alarm monitoring devices.
 - d. Security Equipment & Enclosures.
 - e. Software modules required for specification operation/expansion.
 - f. Turnkey programming for seamless integration of security devices and their event based scenarios as determined by the Owner or their authorized representatives.

1.5 QUALITY ASSURANCE

- A. Turnstile Manufacturer shall be a company specializing in the supply of security optical turnstiles with a minimum of 10 years of experience.
- B. Turnstile Manufacturer shall supply a factory-trained supervisor during installation of the security optical turnstile.
- C. Turnstile Manufacturer must provide for a local, factory-trained, field service technician to competently service the security optical turnstile; and to provide for the local support of the customer's service technicians, if the customer's trained technician is not available.

1.6 ACCESS CONTROL TURNSTILE SUBMITTALS

- A. Submit project specific shop drawings, finish samples and Operating & Maintenance Manuals.

- B. Indicate pertinent dimensions, general construction, component connections and locations, anchorage methods and locations, hardware, and installation details.

PART 2 - PRODUCTS

2.1 GENERAL

- A. All products not provided by the end-user shall be new and unused and shall be of manufacturers current and standard production.
- B. Where two or more equipment items of the same kind are provided, all shall be identical and provided by the same manufacturer.
- C. Drawings and Specifications indicate major system components, and may not show every component, connector, module, or accessory that may be required to support the operation specified. The Contractor shall provide all components needed for complete and satisfactory and intended operation.
- D. Product Availability:
 - 1. Contractor, prior to submitting a proposal, shall determine product availability and delivery time, and shall include such considerations into his proposed Contract Time.
 - 2. Certain products specified may only be available through factory authorized dealers and distributors. The Contractor shall verify his ability to procure the products specified prior to submitting a proposal.

2.2 ACCESS CONTROL ELEVATOR CAB CARD READER

- A. Elevators shall be card reader controlled by the Security Management System (SMS) on an individual floor programmable basis allowing the passenger to access only those floors for which their access card is authorized. The security management system shall also provide for card reader control of the elevators on a time programmable basis allowing access to certain floors to be card reader controlled while allowing simultaneous free access to other floors.
- B. When an elevator is in the card reader control mode, all floor select buttons shall be disabled (except for the recall floor). The passenger shall be required to hold their access card up to a card reader mounted in the elevator return panel. Upon a valid card read, the security management system shall enable the floor select buttons for the floor(s) the passenger is authorized to access. The passenger must then push the desired select button. Once the passenger has pushed the button, the elevator control system shall illuminate the button and send the elevator to the selected floor. When an elevator is in the normal mode, all floor select buttons shall be enabled.
- C. Provide one pair of terminals per controlled elevator such that a maintained dry contact closure across the terminals by the security management system shall place the elevator in the card reader control mode. The elevator shall remain in the card reader control mode as long as the contact is closed and shall return to the normal mode when the contact opens.
- D. Provide one pair of terminals per floor per controlled elevator (except the recall floor) such that a dry contact closure across the terminals by the security management system shall enable the floor select button. The button shall remain enabled for as long as the dry contact is closed.

2.3 ACCESS CONTROL ELEVATOR CARD READER HALL CALL BUTTON (WHEN APPLICABLE)

- A. Hall call button for elevator shall be card reader controlled by the security management system on a time programmable basis.
- B. When in the card reader control mode, the hall call button shall be disabled. The passenger shall be required to hold their access card up to a card reader mounted adjacent to the call button station. Upon a valid card read, the security management system shall enable the call button. The passenger must then push the desired call button. Once the passenger has pushed the button, the elevator control system shall illuminate the button and call the elevator to the floor.
- C. Provide one pair of terminals per controlled call button such that a dry contact closure across the terminals by the security management system shall enable the call button. The button shall remain enabled for as long as the dry contact is closed.

2.4 VIDEO SURVEILLANCE ELEVATOR CABS

- A. The Security Contractor shall provide video cameras for surveillance of elevators when illustrated on Drawings of Record.
 - 1. Elevator/Security Management System Interface
 - a. Provide an elevator/security management system interface cabinet in each elevator machine room. The interface cabinet shall contain all required interface terminals including, but not limited to:
 - 1) Card Reader Interface six conductor per card reader controlled elevator contractor to verify cabling requirements for reader prior to installation.
 - 2) Card Reader Control Mode one pair per card reader controlled elevator.
 - 3) Floor Select Button Enable one pair per floor per card reader controlled elevator.
 - 4) Emergency Pushbutton Monitoring one pair per elevator.
 - 5) Hall Call Button Enable one pair per card reader controlled hall call button.
 - 6) Hall Call Button Remote Control one pair per remote controlled hall call button.

2.5 FIRE ALARM INTERFACE FOR SMS

- A. Automatic Unlock of Electric Locking Mechanisms
 - 1. Provide automatic unlocking of electric locking mechanisms controlled by the security system, upon a fire alarm condition as required by applicable codes and the local Authoring Having Jurisdiction (AHJ).
- B. Monitoring of Fire Alarm Manual Unlock Switch
 - 1. Provide monitoring of the fire alarm system manual unlock switch for electric locking mechanisms control by the security system, as required by applicable codes and the local AHJ.
- C. Auxiliary Monitoring of Fire Alarm and Trouble Conditions
 - 1. Provide auxiliary monitoring of the fire alarm system general alarm and trouble conditions by the security management system.

D. System Interface

1. Provide interface cabinets at each location as indicated below. Each interface cabinet shall contain all terminals required to interface each associated point to the security system as specified herein.
Security Equipment Closets: Automatic Unlock.
Fire Command Center: Manual Unlock and Manual Unlock Switch Position Auxiliary Monitoring (Alarm and Trouble).

E. Fire Alarm Interface Cabinet

1. Provide lockable continuous hinge cover, U.L. listed enclosures with dual-screw barrier terminal strips for each interface point as indicated on the Security Drawings. All terminals shall be labeled to identify their function as defined by the Owner or prevail code.
2. The Architect, prior to installation, shall approve the exact style and finish of each enclosure.
3. Each fire alarm interface cabinet shall provide a tamper switch to be monitored by the security system and shall be keyed as defined by the Owner.

F. Automatic Unlock of Electric Locking Mechanisms

1. Provide normally closed auxiliary dry output contacts such that upon a general fire alarm condition, the contacts shall open, and the security system shall unlock the electric locking mechanism. The contacts shall remain open until the fire alarm system is manually reset.

G. Monitoring of the Manual Unlock Switch

1. Provide a normally closed auxiliary dry output contact for security monitoring of the position status of the fire alarm manual unlock switch. The contact shall open when the switch is placed in the unlock position and shall remain open until the switch is returned to the locked position.
2. Provide any hardware/software required to interface the fire alarm manual unlock switch to the security system.
3. Provide and terminate all conduit, power and wiring required for the monitoring of the manual unlock switch.

H. Auxiliary Monitoring of Fire Alarm and Trouble Conditions

1. Provide separate normally closed, auxiliary dry output contacts for general alarm and general trouble conditions. Upon an alarm and/or trouble condition the contact shall open and the security system shall annunciate the associated condition. The contacts shall remain open until the fire alarm system is manually reset.

I. Fire Alarm Interface Cabinet

1. Provide interface cabinets in readily accessible, concealed locations, no more than 8'0" A.F.F. Coordinate the exact location of the interface cabinet location with the Architect of Record.
2. Provide any hardware/software, control logic, and/or relays required to interface the fire alarm system to the security system as specified herein.

3. Provide and terminate all conduit, power, and wiring required for the installation of each interface cabinet.
 - a. Provide one spare pair of wires, for future use, between the fire alarm system and each interface cabinet.
4. The Security Contractor shall provide and terminate all wiring from the interface cabinet to the security system.
5. All wiring shall be U.L. listed for fire alarm applications.

2.6 ACCESS CONTROL TURNSTILE SYSTEM

- A. This section covers the furnishing and installation of a complete Security Optical Turnstile. Provides a complete turnkey system that has been fabricated, assembled, and tested for proper operation at the factory.
- B. It includes cabinet, removable panels, swinging glass panels, barrier glass (cabinet), motor columns with drive system, hardware, cabling, self-diagnostics tool, safety system and infrared sensor system as required for installation.
- C. The optical glass panel turnstile provided shall provide two-way traffic, one-way traffic, or a blocked barrier (closed entry/exit). Throughput is defined as the number of people per minute which can pass through an optical turnstile in one direction only. The average throughput of the turnstile shall provide approximately 25-30 people per minute.
- D. Remote controls: a minimum of (2) tablets shall be provided at the sites Security Command Center (SOC) to permit full remote control of turnstiles.
- E. Construction
 1. Cabinet panels shall be manufactured from a minimum of #4 brushed stainless steel.
 2. Swinging glass door panels shall be manufactured of a minimum of 10 mm flat, clear tempered safety glass. When applicable tall glass panels shall include a flag shaped back edge for enhanced security.
 3. Top plate is to be manufactured from Black Safety Glass or optional Powder Coated Aluminum, RAL #059/80106 10% Gloss Finish.
 4. Front cover plate is to be manufactured from Owner approved Black Safety Glass or optional Powder Coated Aluminum RAL #059/80106 10% Gloss Finish.
 5. Motor column and plinth (base) covers shall be composed of powder coated stainless steel.
 6. Control system shall provide a microprocessor controlled closed area.
- F. Hardware Materials
 1. Sheet Metal: All sheet metal shall be 304 #4 brushed stainless steel or powder coated steel.
 2. Safety Glass: All barrier glass shall be 10 mm clear safety glass. Cabinet panel glass on lane Swing Only shall be 8 mm clear safety glass. All cabinet top and front glass shall be 1/4" black coated safety glass.
 3. Plate Aluminum: All plate aluminum shall be 6 mm 1050-H24 or equivalent plate.
 4. Hardware: All hardware to be metric thread to conform to ISO or DIN standard.

5. Plastics: Dark Grey IR Polycarbonate

G. Finish

1. The following finishes are available for the removable panels, bottom plinth covers, face and top cover plate.
2. Painted Coatings:
 - a. AAMA 2605 Superior Performing Organic Coatings (e.g.: Duranar, Fluoropon; 70% Kynar Fluoropolymers).
 - b. AAMA 2604 High Performance Organic Coatings (e.g.: Powder Coating).
3. Stainless Steel Clad Type 304:
 - a. #4 Brushed Satin
 - b. #8 Highly Polished (mirror finish) – Slide bottom center plinths only.
4. Powder coat:
 - a. Top - Black: Tiger #059/80106 10% Gloss
 - b. Lower Front Plinth - RAL 9005 gloss 80%

H. Equipment

1. Drive System: Electromechanical drive system specially designed for the mounted inside the cabinet(s) together with all the controls. The drive system may allow for bi-directional or one way traffic. (Requires 110-240 VAC, 1 Phase, 15A service from below)
2. Locking Device: The locking device is an electromagnetic brake activated in the closed position and will withstand up to 120Nm pushing force.
3. Power Loss: In the event of power loss, the Swing barriers can open manually for egress.
4. Controls: Factory installed; purpose built microcontroller platform with embedded custom software.
5. Power Saving Mode/Sleep mode. The Swing will go into sleep or power saving mode after pre-set time, wake-up detection by sensors in the leading face.

I. Communication System

1. Authorized entry method, the turnstile lane shall signal the user when the unit receives the authorized access signal from the access control system.
2. The lane shall signal the authorized user to step into the lane.
3. The visual signal will be an LED strip on both sides of the unit tracing the authorized direction through the lane. In addition, a violation LED signal and audible alarm can be activated within the unauthorized entry compartment.
 - a. Security Reporting: The lane must have the capability of providing security violation alerts to the access control system or an on-site remote panel (not supplied by the turnstile MFG.).
 - b. Inputs: Seven configurable inputs are available.
 - c. Outputs: Six configurable outputs are available in a Normally Open, or Normally Closed state.

J. Security Equipment

1. Actuation: Barrier actuation by card reader mounted under the top glass. (Not supplied by Boon Edam)
2. Actuation Device: Although tied into the turnstile, actuation devices are provided by the Access Control Integrator.

3. Sensor System: A series of infrared sensors incorporated inside of the cabinet to perform the following functions:
 - a. Entry sensors: These sensors detect the initial presence of the user, once the person has passed the entry sensors, any following unauthorized users must also be granted access, otherwise a tailgate detection will occur resulting in an alarm.
 - b. Tailgate Sensors: These sensors detect the presence of an individual who has passed through the entry sensors and is moving into the safety sensor area. In conjunction with the Entry sensors, the unit can detect directional movement and indicate potential unauthorized/tailgating or entry attempts.
 - c. Safety Sensors: Six sensors cover the area near and around the swinging glass panel (barrier). If a user stops in the Safety Sensor area, the glass panels will not close on the user. For safety purposes, the glass panels will not close on users who tailgate. Rather, an alarm will generate indicating an unauthorized entry has been attempted.
 - d. Return Signal Booking Sensors: These sensors tell whether an authorized user has passed through the unit. A signal is generated from the controller to the Access Control System to verify the user has successfully passed into the authorized direction of travel.
 - e. Passage Position Sensors: These sensors determine the position of the user and start the closing sequence of the glass panels. Once a user has passed through the Safety Sensors and clears the Passage Position Sensors, the glass panels will start closing.
 - f. Trolley Detection Sensors: These sensors indicate that a trolley/suitcase has entered with an authorized user. When activated, the lane will remain open an extended period to allow for proper passage of the trolley/suitcase.
 - g. Climb over Sensor System: A sensor system is integrated into the top plate to detect persons attempting to climb over the cabinet while the lane is sitting in sleep or standby mode.
4. Configurable Inputs and Outputs: The control module includes a series of field configurable inputs and outputs which can be selected for optimal use:
 - a. Inputs: Seven configurable inputs are available. Specific inputs will be configured as listed in Section 2.08 Access Control and Fire Alarm Integration
 - b. Outputs: Six configurable outputs are available in either Normally Open, or Normally Closed state. Specific outputs will be configured as listed in Section 2.08 Access Control and Fire Alarm Integration.
 - c. Service Tool Software: PC software allowing connection to the control system allows the following:
 - 1) Upload and download software and configuration capabilities.
 - 2) Setting of times, and I/O configuration adjustments.
 - 3) Monitoring and troubleshooting of sensor matrices.
 - 4) Maintenance tracking
 - 5) Comma Separated Values (CSV) event log file reporting system for service, maintenance and configuration tracking methods.

K. Safety System

1. Safety Sensors: Sensors cover the area near and around the swinging glass panel (barrier). If a user stops in the Safety Sensor area, the glass panels will not close on the user. For safety purposes, the swinging glass panels will not close on users who tailgate. Rather, an alarm will generate indicating an unauthorized entry has been attempted.
2. Torque: A preset parameter within the programming of the drive system provides rotation force to be minimized, allowing the door set to be stopped manually by applying pressure against its rotation.

L. Access control and fire alarm integration

1. The turnstile must be capable of integrating with the Access Control System (ACS) and Fire Alarm System via a series of dry contact potential free input signals. Control wiring from the ACS system is to be connected (integrated) to the turnstile via an I/O board, or terminal strip, supplied within the turnstile control system (ACS cabling supplied by others).
2. Control Inputs and Outputs: Signals from the ACS controls the Lifeline Security Optical Turnstile and are connected to the designated I/O board or terminal strips. A total of 7 pair of stranded 20 AWG Shielded Conductors are recommended for the inputs, 1 pair of 18 AWG Shielded Conductors for Fire Alarm Relay Input and 6 pair of stranded 20 AWG Shielded Conductors for the Alarm Outputs.
3. Fire Alarm: Each master cabinet must have its own dedicated fire alarm relay signal, normally closed contact (opens on active alarm), dry contact circuit. Turnstiles can be programmed to open in desired direction – toward non-secure (egress) or toward secure side. All LED's will illuminate green. Once the alarm is reset lanes will resume normal operation. Fire alarm overrides all other functions.
4. ACS credential readers as required by the Design of Record shall be seamlessly installed and fully functional for operation for each turnstile provided.

M. Remote Control Tablet

1. Provide remote control touch panel desk tablets for remote lane bank controls.

N. Standards Compliance

1. UL Standard 325 and 2593
2. CSA22.2 #247(Canada)
3. ANSI Z97.1 - American National Standard for Safety Glazing Materials used in Buildings.
4. AAMA 2604 - Voluntary specification, Performance Requirements and Test Procedures for High Performance Organic Coatings on Aluminum Extrusions and Panels.
5. AAMA 2605 - Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels.
6. ASTM A 480/A 480M - Standard Specification for General Requirements for Flat-Rolled Stainless and Heat-Resisting Steel Plate, Sheet, and Strip.
7. ASTM B 209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
8. ASTM B 221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.

O. Panel Control

1. Provide ADA compliant glass panel door for non-credential egress control only.

2. Provide full height Flag glass panel door for egress control.
 3. Provide side full height panels as needed to secure passage.
- P. Acceptable Manufacturer: Basis of Design - Boon Edam Lifeline Speedlane Full Height Swing Optical Turnstile or an approved equal.

PART 3 - EXECUTION

3.1 LANGUAGE USAGE

- A. English language shall be used throughout the security system, signage, labels, voice messages, instructions, manuals, software, and graphic displays.

3.2 EXAMINATION OF CONDITIONS

- A. Prior to the start of work, carefully inspect the installed work of other trades and verify that such work is complete to the point where installation may properly commence. Start of work indicates acceptance of conditions.
- B. Install equipment in accordance with applicable codes and regulations, the original design intent, and the referenced standards.
- C. In the event of a discrepancy, immediately provide notification notify the Project Manager.
- D. Do not proceed with installation until unsatisfactory conditions and discrepancies have been fully resolved.

3.3 PROTECTION OF SYSTEMS AND EQUIPMENT

- A. Protect materials and equipment from damage during storage at the site and throughout the construction period. Equipment and materials shall be protected during shipment and storage against physical damage, dirt, theft, moisture, extreme temperature, and rain.
- B. Damage from rain, dirt, sun, and ground water shall be prevented by storing the equipment on elevated supports and covering the sides with securely fastened protective rigid or flexible waterproof coverings.
- C. During installation, equipment shall be protected against entry of foreign matter on the inside and be cleaned both inside and outside before testing, operating, or painting.
- D. As determined by the Project Manager, damaged equipment shall be fully repaired or shall be removed and replaced with new equipment to fully comply with the requirements of the contract documents. The decision of the Project Manager shall be final.
- E. Damaged paint on equipment and materials shall be repainted with painting equipment and finished with the same quality of paint and workmanship as used by the manufacturer.

3.4 ACCESS TO EQUIPMENT

- A. Equipment shall be installed in a location and manner that will allow convenient access for maintenance and inspection.

- B. Working spaces shall be not less than specified in the National Electrical Code (NEC) for voltages specified.
- C. Where the Project Manager determines that the installed equipment is not conveniently accessible for operation and maintenance, equipment shall be removed and reinstalled, one time only, as directed by the Project Manager, at no additional cost. "Conveniently accessible" is defined as being capable of being reached without the use of ladders or without climbing or crawling under or over obstacles such as motors, pumps, belt guards, transformers, piping, and duct work, except where required by design or intent.

3.5 INSTALLATION

- A. The Contractor shall carefully follow the instructions in the manufacturers Installation Manual to ensure all steps have been taken to provide a reliable, easy to operate system.
- B. The Administrator Terminal shall be connected to the remote terminals before connecting to any card reader processors.
- C. Perform all Work as indicated in the Drawings and Specifications.
- D. The Contractor shall install the appropriate cable from the CPU to readers, door contacts, request-to-exit devices, and electric locks at each door and/or gate.
- E. All communications cables shall be kept away from power circuits.
- F. The Contractor shall install the power supply(s) for electric locks in locations where they won't interfere with other operations.
- G. The Contractor shall also execute adequate testing of the system to ensure proper operation.
- H. The Contractor shall provide adequate training of the system users to ensure adequate understanding to prevent operating errors.

3.6 TURNSTILE INSTALLATION

- A. Inspection: Installer must examine the location and advise the Contractor of any site conditions unacceptable for proper installation of product. The minimum conditions necessary to initiate installation are:
 - 1. Floor must be dead level at any point within the footprint of the door.
 - 2. Finished floor must be installed.
 - 3. Floor must be complete with conduit supplied to meet manufacturer's specified drawings.
 - 4. Power supply (110-240 VAC) must be installed. Power and communication come from the floor to the secure side of the cabinet as per approved specified drawings.
- B. Erection: Install turnstile in accordance with manufacturer's printed instructions. Set units level, plumb, and with uniform hairline joints. Anchor securely into place. Use only factory trained installers.
- C. Adjustment: Installer shall adjust turnstile, hardware and sensors for smooth operation and proper performance.

- D. Instruction: A factory-trained installer shall demonstrate to the owner's maintenance crew the proper operation of the Lifeline Security Optical Turnstile and the necessary service requirements such as lubrication, cleaning, and inspection of components upon completion of installation.
- E. Cleaning: Clean metal and glass surfaces carefully after installation to remove excess caulk, dirt, and labels.

3.7 WORKMANSHIP

- A. Comply with highest industry standards, except when specified requirements indicate more rigid standards or more precise workmanship.
- B. Perform Work with persons experienced and qualified to produce workmanship specified.
- C. Maintain quality control over suppliers and Subcontractors.
- D. Quality of workmanship is considered important. Project Manager will have the authority to reject Work which does not conform to the Drawings and Specifications.

3.8 EQUIPMENT PRE-TEST

- A. All equipment shall be bench tested as per the manufacturer's instructions prior to delivery to the job site and prior to installation.

3.9 WIRE AND CABLE

- A. Design, layout, size, and plan new wire and cable runs as required.
- B. All wire and cable from the processors to all devices at each door shall be "homerun" unless otherwise specified.
- C. All wire and cable, including any wire and cable that is existing and will be reused in the Work, shall be installed in conduit or surface metal raceway, except as follows:
- D. Wire or cable, in lengths of less than ten (10) feet, that is "fished" within walls, ceilings, and doorframes.
- E. All wire and cable passing through metalwork shall be sleeved by an approved grommet or bushing.
- F. Avoid splicing conductors. All splices shall be made in junction boxes (except at equipment). Splices shall be made with an approved crimp connection. Wire nuts shall not be used on any low-voltage wiring. Where necessary, provide heat-shrink to insulate all wire splices and connections. The use of electrical tape for splices and connections shall not be acceptable.
- G. Identify all wires and cables at terminations and at every junction box. Identification shall be made with an approved permanent label, or equal.
- H. Furnish and install all SMS wire and cable except for traveling cable for elevator control and monitoring.

- I. Coordinate the protection and routing of wire and cable requiring isolation from power, radio frequency (RF), electromagnetic interference (EMI), telephone, etc. with the Architect.
- J. Run all wire and cable continuous from device location to the final point of termination. No mid-run cable splices shall be allowed.
- K. Wire and cable within ICs, power distribution cabinets and other security enclosures shall be neatly installed, completely terminated, pulled tight with slack removed and routed in such a way as to allow direct, unimpeded access to the equipment within the enclosure. All wire and cable shall be bundled and tied.
- L. Provide heat-shrink to insulate all wire splices and connections. The use of electrical tape for splices and connections shall not be acceptable.
- M. Visually inspect all wire and cable for faulty insulation prior to installation.
- N. Provide grommets and strain relief material where necessary to avoid abrasion of wire and excess tension on Wire and Cable.
- O. Make connections with solder-less devices, mechanically and electrically secured in accordance with the manufacturers' recommendations. Wire nuts shall not be an acceptable means of connecting wire and cable.
- P. Neatly bundle and wrap all horizontally run (above accessible ceilings and not within conduit) wire and cable at three-meter intervals. Provide supports as required. All supports shall be UL listed for the application.
- Q. All System wiring within vertical riser shafts (as required) shall be bundled, wrapped, and tied to the structure at three-meter intervals to isolate it from other wire and cable within the shaft. Additionally, all wire and cable within the shaft shall be supported at least every two floors. Provide all personnel and equipment necessary to install and support the cable. All equipment shall be UL listed for the application.

3.10 CONDUIT AND RACEWAY INSTALLATION

- A. Design, lay-out, size and plan new conduit and raceway systems as required.
- B. Conduit shall be required in all exposed and/or inaccessible areas including, but not limited to finished areas concealed in chases, furring's, concrete slabs, and above finished ceilings. Provide pull boxes as necessary.
- C. No exposed conduit shall be installed within public areas without Owner written permission.
- D. Indoor Requirements:
 - 1. Route exposed conduit and raceway parallel and perpendicular to walls and adjacent piping.
 - 2. Group conduit in parallel runs where practical and use conduit rack constructed of steel channel with conduit straps or clamps.
 - 3. Use conduit bodies to make sharp changes in direction, as around beams. Fasten conduits and raceways to structural steel using approved spring clips or clamps.

4. Where conduit penetrates fire-rated walls and floors, seal opening with UL listed fire rated sealer or other methods as approved by codes.
5. No exposed conduit, raceway, or junction box shall be installed within any office area.
6. Install all boxes straight and plumb.
7. Do not support conduit from mechanical, plumbing, or fire sprinkler systems.
8. Drill or core drill all holes in walls, ceilings, or floors where required for new conduits. Do not cause damage to any structural steel or other structural support member by drilling or cutting.
9. Do not use flexible conduit in lengths longer than six (6) feet.

E. Outdoor Requirements:

1. In locations where conduit penetrates exterior walls, seal opening around conduit in an approved manner to make watertight.
2. Use galvanized straps and fasteners on all exterior conduits. All exterior boxes will only be used to aid in pulling the cable between points.
3. All exterior boxes will only be used to aid in pulling the cable between points.

3.11 PENETRATIONS

- A. Do not penetrate any roof, flashing, exterior wall, or parapet without prior approval from designated Construction Project representative.
- B. When penetrating a fire wall for passage of cables and/or conduit, always provide a fire-stop system that complies with code and the local authority having jurisdiction.

3.12 FIRE RATED DOORS AND FRAMES

- A. Do nothing to modify a UL-rated door or frame that would void the UL-label or fire rating.

3.13 GROUNDING

- A. Provide earth-grounding of equipment as required by equipment manufacturer. Earth ground shall be connected to ground rod or approved cold water pipe. Electrical or telephone ground connections shall not be used as earth grounds. Connections to mounting posts or building structural steel shall not be used as earth grounds.

3.14 POWER TO SECURITY EQUIPMENT

- A. Power all equipment from circuits dedicated for security use, except as noted. Mark all panel circuit breakers with labels worded "Security Equipment - Do Not Operate", or equivalent.
- B. All plug-in transformers shall be located at the security control panels. Secure all low-voltage plug-in transformers to outlet with screw or strap. Clearly label all transformers to identify purpose and use.
- C. AC power dedicated to security and on generator backup shall be provided for the Security System as indicated on the Documents. Coordinate with the Architect to establish locations of dedicated AC circuits.
- D. Connect to the AC power and provide UL listed power supplies and transformers to distribute low voltage power to the System components as required.

- E. Provide hinged cover terminal cabinets with tamper switches for all power supplies, transformers, and power distribution terminal strips. Provide all conduit and wiring from the AC power facilities to the terminal cabinets.

- F. Surge Protection

1. Provide protection against spikes, surges, noise, and other line problems for all System equipment and components.
2. Protect all exterior video, control, power, signal cables, and conductors against power surges. Video surge protectors shall not attenuate or reduce video and sync signals under normal conditions. Each surge protector shall be UL Listed.

3.15 CUTTING AND PATCHING

- A. The Contractor shall be responsible for all cutting, fitting, or patching that may be required to complete the Work.

3.16 PAINTING

- A. All surface raceway systems shall be painted to match the surfaces they are attached to.

3.17 PLYWOOD BACKING

- A. Install the processor(s), power supplies, and all other related equipment on a plywood backboard for testing in the shop. The mounted assembly will then be transported "as is" to the job site for mounting in the Communication Room.
- B. Fasten the plywood backing to the wall using a hanger bolt at the four corners which align with pre-drilled holes in the plywood. Secure with flat washers and a nut.

3.18 CLEANING

- A. During construction, and prior to acceptance of the building, remove from the premises and dispose of packing material and debris caused by electronic security work.
- B. Remove dust and debris from interiors and exteriors of electrical equipment. Clean accessible current carrying elements prior to being energized.

3.19 GENERAL

- A. Provide necessary work as detailed in Section 28 00 00.

3.20 SITE INSPECTIONS

- A. Continuously verify that the site conditions are in agreement with the Documents and the design package. Submit a report to the Architect documenting changes to the site or conditions that affect the 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. No deficiency shall be corrected without written permission from the Architect.

- B. Specific mounting locations, exact wire and cable runs, and conduit routing have not been specified or delineated on the Documents. Coordinate all aspects of the Work with the Architect.

3.21 COORDINATION

- A. Coordinate with the Architect to ensure that adequate conduit is provided, and that equipment back-boxes are adequate for System installation.
- B. Coordinate with the Architect to ensure that adequate power has been provided and properly located for the security System equipment.
- C. Coordinate with the Architect to ensure that doors and doorframes are properly prepared for electric locking hardware and door position switches.
- D. Coordinate locations of all devices with the Architect prior to installation.
- E. Coordinate and verify the location of each piece of rack-mounted equipment with the Owner.
- F. Coordinate finishes and colors of all equipment with the Architect. Submit all finishes and graphics for all equipment in public areas to the Architect for approval prior to installation.

END OF SECTION

SECTION 28 23 00

VIDEO SURVEILLANCE

PART 1 - GENERAL

1.1 GENERAL REQUIREMENTS

- A. Applicable requirements of Division 01 - General Requirements and Division 28, Section 28 00 00 shall be considered a part of this section and shall have the same force as if printed herein full.
- B. The work to be done under this section of the Specifications shall include the furnishing of labor, material, equipment, and tools required for the complete installation of the work indicated on the Drawings, as specified herein, or as noted in other sections of Division 28 – Electronic Safety and Security.
- C. All materials, obviously a part of the electronic security infrastructure and necessary to its proper operation, but not specifically mentioned or shown on the Drawings, shall be furnished, and installed without additional charge.
- D. The Drawings and Specifications are complementary to each other and what is called for by one shall be as binding as if called for by both. If a discrepancy exists between the Drawings and Specifications, the higher cost and/or higher level of functionality shall be included to meet the design intent.
- E. Work and products provided must conform to the State of Delaware's Building Access Security Standard, SE-ACCESS-001. This standard as authorized by Delaware Law, Title 29, Chapter 90C mandates the use of specific technology and products to establish consistency in both quality and the security as well as interoperability.
- F. The security contractors must be an approved vendor with the Delaware Department of Technologies & Information (DTI) and currently certified on all security related systems. Submittals/work shall be restricted to vendors have met the minimum requirements and are listed as a security vendor by the manufacturers and approved by the Owner or their authorized representative. The work detailed in these specifications and associated drawings are an expansion of the Owner's existing Security Management System (SMS). The products utilized on this project must be fully and completely compatible and supported by the Owner's existing SMS with no exceptions.

1.2 RELATED SECTIONS

- 1. 28 00 00 Electronic Safety and Security

1.3 WORK INCLUDED

- A. The work shall consist of turnkey system comprised of these core systems:
 - 1. Access Control System
 - 2. Security Communication Systems
 - 3. Video Surveillance System
 - 4. Wire and cable to install all equipment as specified herein
 - 5. Miscellaneous conduit, power supplies, and back boxes (not shown on the Documents as provided, but required for a complete installation)

- B. The system shall be an expansion to the main courthouse and the Video Surveillance System (VSS) must seamlessly integrated to the states existing infrastructure and standards. The courthouse expansion shall be a Milestone Enterprise class system. The contractor shall provide network video recorder server(s) and all required software, hardware, and programming as required to seamless integrate the new video hardware into the courthouse and state based Milestone video system.
- C. This Section describes the facility video surveillance system, including installation of all, cameras, camera controllers, power supplies, wiring, conduit systems, and all other required appurtenances for a complete working system:
 - 1. The system as described shall be installed, tested, and delivered in first class working condition. The system will include all required hardware, software, programming, and wiring to accomplish the requirements of the specification and contract drawings.
 - 2. All materials furnished will be new and of the latest design available from a manufacturer who is engaged in the manufacture and sale of digital video surveillance systems. The manufacturer shall have an installed base of similar systems as a reference.
 - 3. While the contract documents identify the location and quantities of equipment for estimating purposes, the installation of all wiring (power, network, video, and control), field devices, and equipment will be based on the complete vendor's/manufacture's wiring diagrams and equipment layouts as approved for this project. The Contractor, prior to installation, shall submit the design documents for approval.
- D. The Contractor shall coordinate on system operational requirements and video storage requirements.
- E. The Contractor shall provide a complete system design based on the requirements as set forth in the contract documents. Provide seamless integration with the card access control and security communications systems.
- F. The IP-based system shall leverage the facility IT network infrastructure for system communications in as much as possible.

1.4 SCOPE OF WORK

- A. The scope of work to be included in this contract does not necessarily include every item the security contractor shall provide required information prior to installation.
- B. The Video Surveillance System (VSS) shall be an IP network based fully distributed digital video system. The VSS system will be a new install and shall integrate into the access control system.
- C. The system will utilize Local Area Networks as a transmission medium for video, configuration, as well as storage of all data. The system shall provide full video control at the master control station, with additional full selection capability at any point within the network.
- D. The contractor shall setup graphical maps indicating all cameras in plan.
- E. Verification that proposed equipment and devices furnished are adequate and well suited for the intended purpose.
 - 1. Perform a layout check to ensure that adequate access is available for construction, installation, and maintenance of equipment and devices furnished; however, the Contractor is not responsible for furniture.
 - 2. Perform acceptance tests to show system is properly installed and that it meets the specifications and applicable codes.

3. VSS system administration will be by end-user. The System Administrator shall be responsible to configure and maintain the system after Camera Installation. System utilities shall be provided for the System Administrator to use.

1.5 REFERENCES

A. Abbreviations and Acronyms:

1. ACC: Advanced Audio Coding.
2. ACS: Access Control System
3. AES: Advanced Encryption Standard.
4. API: Application Programming Interface.
5. CA: Certificate Authority.
6. DLNA: Digital Living Network Alliance.
7. DWG: Drawing file format.
8. DXF: Drawing Interchange Format or Drawing Exchange Format.
9. EULA: End User License Agreement.
10. FIPS: Federal Information Processing Standards.
11. FPS: Frames per Second.
12. Full HD: High Definition video resolution of 1920 x 1080 pixels.
13. GB: Gigabyte.
14. GIS: Geographic Information System.
15. GOP: Group of Pictures.
16. H.264/H.265: Video compression formats.
17. HD: High Definition video resolution of 1280 x 720 pixels.
18. HTML: Hyper Text Markup Language.
19. HTTPS: Hyper Text Transfer Protocol Secure.
20. I/O: Input/Output.
21. IP: Internet Protocol.
22. JPEG: Joint Photographic Experts Group (image format).
23. LAN: Local Area Network.
24. LPR: License Plate Recognition.
25. MPEG: Moving Picture Experts Group (video format).
26. NAS: Network Attached Storage.
27. NAT: Network Address Translation.
28. NVR: Network Video Recorder.
29. ONVIF: Open Network Video Interface Forum.
30. PTZ: Pan-Tilt-Zoom.
31. RTSP: Real Time Streaming Protocol.
32. SDK: Software Development Kit.
33. SNMP: Simple Network Management Protocol.
34. SVQR: Scalable Video Quality Recording.
35. UPnP: Universal Plug and Play.
36. UPS: Uninterruptible Power Supply.
37. VMS: Video Management System.
38. WAN: Wide Area Network.

PART 2 - PRODUCTS

2.1 VIDEO SURVEILLANCE SYSTEM (VSS)

A. GENERAL

1. Provide Camera license for a quantity of cameras indicated in the design documents. Contractor shall provide 10 spare licenses for future use by the end user.
2. The State shall mandate the minimum video retention based on the State Capitol retention requirements that shall be based on the area monitored.
3. This retention requirements shall be sized to provide at a minimum of 90 days of recording with 60% motion using each cameras full resolution and framerate.
4. Areas of detention retention period shall be sized and recorded at unique rate that is different from general monitoring areas as determined by the state.
5. Description of Work: Deployment of VMS includes installation and setup of network recorder server hardware and software.
6. The VSS and ACS shall be unified and seamlessly integrated by a full partnership agreement between each manufacturer.
7. New deployments shall provide a failover server.

2.2 VIDEO MANAGEMENT SYSTEM (VMS) COMPONENTS

A. The VMS shall support the integration of contractor provided Milestone Network Video Recorders (NVR) and all video surveillance devices within the project documents. This integration shall allow the viewing of live streaming video in the browser interface and recorded video playback:

1. Events in the alarm subsystem can initiate video recording. Video motion detection, camera up and camera down messages from the VMS can initiate alarms.
2. It shall be possible to monitor NVR cameras in the same views as IP cameras. VMS events shall be logged in the system activity log. It shall be possible to view recorded video of events from the Activity Log.
3. It shall be possible to view live cameras through floor plans, on the camera view pages, on the Monitoring and Widget Desktops.
4. It shall be possible to pull up recorded video through reports.

B. Servers/Storage minimum requirements:

1. Appliances must integrate with access control, event monitoring, and video management into a unified user interface for: live viewing, forensic searching, and video exporting.
2. Provide Windows Server 2019 standard or greater
3. Provide Redundant Power Supplies
4. Provide RAID 1 or greater
5. Provide Xeon Bronze Processor or greater
6. Provide 16 GB of RAM or greater
7. Provide OS and App on SSD Primary Drives
8. Provide NIC Gigabit or greater

C. System Architecture: The VMS shall consist of:

1. Servers: One or more VMS servers.
 - a. Physical or virtualized Windows servers.
 - b. Virtualized Windows servers using:

- 1) Microsoft Hyper-V.
 - 2) VMWare.
- c. UPS provided to physical servers, network infrastructure and devices such as cameras.
2. Server Software Components: One or more software components by Manufacturer, or software components made by others as noted, per VMS server.
 - a. Management Server: Central service component of the VMS responsible for handling system configuration, distributing the configuration to other system components, such as recording server services, and for facilitating user authentication.
 - b. Failover Management Server: Installation of the management server service in a Microsoft Windows Failover Cluster, or similar, which ensures that another server takes over the management server function, should the first server fail.
 - c. Recording Server: Service responsible for communications, recording and event handling for all devices (cameras, video and audio encoders, I/O modules, metadata sources, etc.), including:
 - 1) Retrieving video, audio, metadata, and I/O event streams from devices.
 - 2) Recording video, audio, and metadata.
 - 3) Providing access to live and recorded video, audio, and metadata.
 - 4) Transmit live audio from operator's microphone to one or more camera speakers or supported IP speakers.
 - 5) Providing access to device status.
 - 6) Triggering system and video events on device failures, events, etc.
 - 7) Writes video streams, audio streams and their metadata to a high-performance media database.
 - 8) Performing motion detection and generate smart search metadata.
 - 9) Communicating with other VMS products when using interconnected technology.
 - d. Failover Recording Server: Implementation of recording server service designated to take over recording and other tasks should an active recording server fail.
 - 1) Failover recording server shall operate in two modes: cold-standby for monitoring multiple recording servers and hot-standby for monitoring a single recording server.
 - 2) Both cold- and hot-standby mechanisms shall offer fully automatic and user transparent failover in the event of hardware or system failure, with automatic synchronization of video, audio and metadata at system recovery.
 - e. Event Server: Service that handles various tasks related to events, alarms, maps, and third-party integrations via the Software Development Kit (SDK).
 - f. Failover Event Server: Implementation of event server service by installing event server in a Microsoft Windows Failover Cluster, to ensure that another server takes over should the first server fail.
 - g. Log Server: Service that writes all system, audit, and rule-triggered log messages to database.
 - h. Service Channel: Service responsible for communicating the following:
 - 1) Service and configuration messages to full viewing client.
 - 2) Updates to a video wall monitor layout.
 - 3) Communicating that a specific failover recording server is active.

- i. Mobile Server: Service responsible for hosting the web client and for providing access to the VMS for web client and mobile client users.
 - j. ONVIF Out: Optional server, plus 64-bit plug-in for management client. This is to enable private-to-public video integration.
 - k. DLNA Out: Service to enable display of live video on any DLNA compliant TV or displays without the need for additional equipment.
 - l. Microsoft SQL Server: Microsoft database server service for the management server, event server and log server services.
 - m. Microsoft Active Directory (required for federated architecture): Active Directory is not required for single-site systems but is recommended for cyber security purposes.
3. PC or Laptop Workstations: One or more PCs or laptops for client software applications intended to run on Windows-based PCs and laptops.
 - a. Management Client: The administration interface for all parts of the VMS, designed to be run remotely from, for example, an administrator's computer.
 - b. Full Viewing Client: Designed for day-to-day use by dedicated operators, to be run remotely on the operator's computer. Full viewing client provides dedicated task-oriented tabs for Live Video, Video Playback, Search, plus dockable tabs for System Monitor and Alarm Monitor. Full viewing client supports definable keyboard and joystick button shortcuts for frequently-used actions, including window or camera selection.
 - c. Web Client: Browser-based application for the occasional or remote user that needs easy access to live video monitoring and audio listening with PTZ control including use of presets, and video and audio playback and export, with defined exports available for later usage or download.
4. Tablets or Smartphones: One or more tablets or smartphones using web client (see above) or mobile client.
 - a. Mobile Client: Native mobile app for smartphone or tablet users, for easy access to live and playback of cameras, and to activate system events and outputs. Additionally, for use as a remote recording device by using the mobile device's built-in camera, whereby video from the device's camera is streamed back to the VMS and recorded like a standard camera.
5. Wide-Area Surveillance System: Optionally one or more individual VMS products connected to gain central surveillance operation across geographically dispersed sites.
 - a. See paragraph 2.3 C Multi-System Architectures below.
6. Networks:
 - a. Multiple Network Segments: The VMS must support network segmentation into separate device, server, and internet-connected networks.
 - b. Device Network: Local network whose capacity and configuration are suitable for the level of video, audio and metadata data transmission established by the system design and its intended usage.
 - c. Server Network: Local network whose capacity and configuration are suitable for the level of video data transmission, systems integration, and user operations established by the system design and its intended usage.
 - d. Internet-Connected Network: Internet-connected network providing connection to remote VMS sites and private-to-public connection via ONVIF Out. This network is also used for remote user access via the mobile server.

e. Network Traversal:

- 1) Enable software clients to access recording server services from outside a NAT firewall, using public addresses and port forwarding.
- 2) Provide Remote Connect Services that enable secure remote connections to devices across different types of private and public networks.

2.3 SYSTEM DESIGN CRITERIA

- A. Provide component-based system architecture to support scaling of VMS from small systems (up to 100 devices) to very large systems (several thousand devices) for single-site or multi-site deployment, whereby:
 1. All software components can be installed on the same server if the server is able to handle the combined load.
- B. Provide the following capabilities to ensure high VMS availability and performance.
 1. Provide hot and cold failover recording server capabilities.
 2. Support Windows Server Failover Clustering, or similar.
 3. Storage solution shall be configured with RAID10 for Live database and RAID5 or RAID6 for archive database.
- C. Provide server and client software applications that are native 64-bit Microsoft Windows applications.
- D. Support both IPv4 and IPv6 addressing.
- E. Provide simultaneous digital multi-channel live streaming and recording of video from IP cameras and IP video encoders without any software limitations on the number of cameras per recording server, with support for the following codecs and options:
 1. Codecs:
 - a. H.264 and H.265
- F. Provide live video views with an adaptive de-interlacing option, to improve the quality of interlaced video, based on the actual video content received, for example, to smooth area of an image where object lines would otherwise appear as jagged lines.
- G. Provide multiple streams for live viewing using any combination of supported standards, video resolutions and frame rates.
- H. Depending on the requested resolution, provide automatic selection between the video streams configured for multi-live video streaming to these clients:
 1. Full Viewing Client: Live video streams from the Recording Server to the full viewing client or video wall.
 2. Web Client: Live video streams from the Mobile Server to the web client.
 3. Mobile Client: Live video streams from the Mobile Server to the mobile client.
- I. Provide the ability to easily display live video from the installed cameras directly onto any modern consumer-grade TV supporting DLNA functionality.
- J. Provide the following hardware acceleration capabilities to offload full viewing client video processing from the computer CPU to dedicated hardware video processing capabilities:
 1. Provide the ability to use both NVIDIA and Intel GPUs at the same time and automatically load balance the requests for optimal performance.

- K. Provide the following hardware acceleration capabilities to offload recording server video processing from the computer CPU to dedicated hardware video processing capabilities:
 - 1. Provide the ability to use both NVIDIA and Intel GPUs at the same time and automatically load balance the requests for optimal performance.
- L. Provide access to live and recorded video, and the ability to control pan-tilt-zoom cameras in compliance with the relevant ONVIF Profile G and Profiles S standards.
- M. Provide real-time, camera independent motion detection with:
 - 1. Configurable Sensitivity: Configurable and automatic motion-detection sensitivity per camera
 - 2. Searchable Metadata: Searchable motion detection metadata created during motion detection.
 - 3. Exclusion Zones: Multiple motion exclusion zones definable per camera to keep irrelevant motion from triggering recording.
- N. PTZ Control Priorities:
 - 1. Provide 32,000 PTZ priority levels for control of rights between different operators and automatic scanning and patrolling schemes.
 - 2. PTZ Scans and Patrols shall pause for higher-priority manual or event-based camera control, and resume after manual session timeout and completion of event camera control period.
- O. Configurable Pre-Buffering: Provide pre-buffering with variable buffer length, with the ability to place buffer on disk or in memory.
- P. Device Video Quality Optimization: Provide video quality optimized per available bandwidth, device screen resolution, and camera view window sizes in these clients:
 - 1. Full Viewing Client Optimization:
 - a. Switch between all configured live video streams from the cameras to optimize bandwidth consumption and workstation performance.
 - b. Optimize viewing performance for remote viewing according to the available bandwidth and view layouts, maximizing video stream quality per display capabilities of defined views.
 - 2. Web Client and Mobile Client Optimization: Optimize transcoding by capping video stream resolution and frame rate for transmission to web client and mobile client.
- Q. Multicasting: Provide optimization of network load in systems with many users viewing the same camera live, by sending one video stream per camera to multiple full viewing client and video wall instances.
- R. True Multi-Window Support: Provide true multi-window support in full viewing client whereby secondary windows have full functionality and can be operated in independent mode or synchronized mode where they follow the control of the main window.
- S. SNMP Agent: Provide VMS functionality to act as SNMP agent that can generate an SNMP trap upon rule activation.
- T. System Capacities: Provide the following maximum capacities, constrained only by the physical performance capabilities of installed server hardware and network infrastructure:
 - 1. Unrestricted devices.
 - 2. Unrestricted client software users.

3. Unrestricted mobile devices.
4. Unrestricted client PCs or laptops.
5. Unrestricted servers.
6. Unrestricted video walls, with an unrestricted number and combination of display monitors.
7. Unrestricted sites.
8. Unrestricted system rules.
9. Unrestricted time profiles.
10. Unrestricted software client profiles.
11. Unrestricted media storage.
12. Recording rates of at least 30 FPS per camera, limited only by hardware capabilities.

2.4 SYSTEM SECURITY

- A. Control and Information Security: Provide the following data protection measures and user rights management capabilities in support of system confidentiality, integrity, and availability:
1. Data in Transit: Encrypted communication between servers and clients using secure communication CA digital certificates.
 - a. HTTPS connections from recording server to devices that support HTTPS connections.
 - b. Encrypted communication between the recording server and services that retrieve streaming data using customer-provided CA digital certificates for connections to the recording server.
 - c. Encrypted communication between the management server and the recording server using customer-provided CA digital certificates.
 - d. HTTPS connections from VMS clients, SDK clients and services that support HTTPS connections to recording server.
 2. System Configuration Data: Provide password protection of the system configuration backup.
 3. Media Data at Rest Integrity and Encryption: Provide the ability to use password-based protection, including encryption and digital signature settings, per media storage container.
 - a. Two modes of video database encryption using 256-bit AES encryption:
 - 1) Light Encryption. Encrypts only the first part of the MJPEG or MPEG-4/H.264 video, audio, and metadata, to use less processing power for encrypting the video. Video cannot be decoded without the information contained in the encrypted header.
 - 2) Strong Encryption. Encrypts all parts of the video, audio and metadata stored in the database.
 - b. Digitally signed media databases with SHA-2 algorithm to establish a means of detecting modification of stored video, audio, and metadata.
 4. Off-Premises Live and Recorded Video in Transit: HTTPS connections must use trusted CA certificates and support HTTPS connections from:
 - a. Mobile server to browser-based web client and mobile client app.
 - b. ONVIF Out to remote public systems.
 5. Data Integrity of Exported Video:

- a. Export video in database format that can only be viewed in the Full Viewing Client – Player.
 - b. Per-export password protection for playback.
 - c. 256-bit AES encryption.
 - d. Digitally signed media exports with SHA-2 algorithm to establish a means of detecting modification of exported video.
 - e. Include any digital signatures applied in the media database.
 - f. Full Viewing Client – Player’s Verify Signatures function to validate authenticity of exported video recording.
 - g. Option to prevent re-export of exported video.
6. Digital Certificates: Use of customer-provided CA digital certificates for connections to the mobile server.
7. Data Access Control: Provide:
 - a. User profiles restricting device access and video viewing, playback, and export, including by day and time-of-day.
 - b. Timestamped audit log of who logged in, viewed live or recorded video, or exported video.
- B. User Authentication:
 1. Log-in authentication via:
 - a. Microsoft Active Directory.
 2. Auto-Log-In: Use of last used credentials for authentication, with Auto-log-in and auto-restore of camera views.
- C. User Rights Management: Provide common and central detailed management of user rights across all user and programmatic (SDK) interfaces, using roles, users, and user groups:
 1. Tiered User Rights: Assign partial management of permissions to system administrators using the Management Client.
 2. User Rights: Define roles, add and delete users, manage permissions for roles, user groups and users, generate user rights management reports. Tiered user management rights shall enable differentiated administrator rights per administrator role.
 3. User Rights Inheritance: Create sub-management domains where management of a specific set of devices can be assigned to a specific system administrator.
 4. Roles: Defining roles establishes permissions (also called “rights”) that determine which system features may be accessed by users and groups. Provide the following security settings for roles:
 - a. Role Info:
 - 1) General: Management client profiles, full viewing client profiles, evidence lock profile, dual authorization rights, system log-in time profile.
 - 2) Applications: Login to full viewing client, web client and mobile client.
 - 3) Anonymous PTZ Sessions: Enabling anonymous user information for PTZ sessions.
 - b. Users and Groups: Users and groups can be assigned to multiple roles.
 - c. Overall System Permissions: Globally allow or deny permissions for servers, devices, and functions (such as manage, read, edit and delete).
 - d. Specific System Permissions: Allow permissions for specific individual devices and functions:

- 1) Cameras: Visibility, live view (within time profile), playback (within time profile), search sequences, smart search, export, manual recording, bookmark functions, AUX commands, evidence lock functions.
- 2) Microphones and Speakers: Visibility, listen to live audio (within time profile), playback audio (within time profile), search sequences, export, manual recording, bookmark functions, evidence lock functions.
- 3) Inputs and Outputs: Visibility, activation.
- 4) PTZ Control: Manual control, activate PTZ presets, PTZ priority, manage PTZ presets and patrolling, reserve, and release PTZ session.
- 5) Speech: Speak to speakers, speak priority.
- 6) Remote Recordings: Retrieve remote recordings.
- 7) Video Wall: Visibility, edit, delete, operate, playback.
- 8) External Events: Visibility, edit, delete, trigger.
- 9) View Groups: Visibility, edit, delete, operate.
- 10) Servers: Professional server access and authentication details, federated architecture site permissions.
- 11) Matrix: Visibility.
- 12) Alarms: Manage, view, disable alarms, receive notifications.
- 13) SDK: SDK plug-in permissions.

- D. Client Authentication: Provide management server authentication and authorization of connecting clients (full viewing client, management client and SDK clients) and use a session-limited access token for controlling access to the recording server.
- E. The VMS shall have the ability to operate in a FIPS 140-2 compliant mode.

2.5 LOGGING

- A. Provide logging of errors, warnings, system information, user activity, and logs about rules to a centralized database with time, date, and other related information. Logs provide multi-system support and configurable logging limits.
1. System Logs: Log all system related errors, warnings and system information, to be used for troubleshooting.
 2. Audit Logs: Log user activity in client applications including, but not limited to, user system access, configuration changes and operator actions.
 3. Rule-Triggered Logs: Log rules in which the system administrator has specified the "Make new log entry" action.
 4. Log Exporting: Logs can be exported as comma-separated-values (.csv) files.
 5. Log Filtering: Logs can be filtered based on time frame, source name, source type, user, user location, rule name, etc.
 6. Log-Related Options: Settings can be changed about:
 - a. Log retention time.
 - b. Which levels (error, warning, and system information) are logged.
 - c. Log security.

2.6 SYSTEM FUNCTIONALITY

- A. Configuration Management:
1. Real-Time Configuration Change Application: Immediately apply authorized changes of system configuration data for all sites, including, but not limited to licenses, devices,

- rules, schedules, users, maps, alarms, recording, client views, including while recording is in operation.
2. Configuration Data Caching for Continued Operation: Cached recording server configuration data shall ensure continuous operation of recording server during periods where the management server is inaccessible.
 3. Backup and Restore: Built-in backup and restore support for manual system backup of all configuration data, including but not limited to:
 - a. All system configuration data.
 - b. Full device configuration data.
 - c. Maps.
 - d. Alarm settings and definitions.
 - e. Software client views.
 - f. User-defined rules, events, and dashboard customizations.
 - g. Defined video bookmarks.
 4. Configuration Reporting: Provide complete or partial documentation of system configuration, including custom and site-specific free-text information, contractor's notes, and option for logo inclusion.
- B. Customizable Built-in System Monitor:
1. System Dashboard: Dashboard display containing detailed and up-to-date information about current servers and cameras. Dashboard displays include the following items:
 - a. Server Tiles: Displays the status of individual or groups of servers via colored tiles.
 - b. Camera Tiles: Displays the status of the cameras via colored tiles.
 - c. Details on monitoring parameters are shown when a tile is selected.
 - d. Monitoring Parameters: Customizable Normal, Warning and Critical system monitor and event triggers for:
 - 1) General Server Information:
 - a) CPU usage.
 - b) Memory available.
 - 2) Recording Server Information:
 - a) CPU usage.
 - b) Memory available.
 - c) Free space.
 - d) Retention time.
 - 3) Camera Information:
 - a) Live FPS.
 - b) Recording FPS.
 - c) Used space.
 2. System Details: Detailed real-time display and reporting of system performance and conditions for:
 - a. General Server Information:
 - 1) CPU and memory usage.
 - b. Recording Server Information:
 - 1) CPU and memory usage.

- 2) Pie-chart status information for the storage elements on each hard drive: video recordings and archives; other data, including video archives from other archive storage locations (such as network drives); free space, disk size.
 - 3) Network adaptor usage.
 - 4) Storage container usage.
 - 5) Camera information.
 - c. Camera Information: A table containing:
 - 1) General status.
 - 2) Recording status.
 - 3) Camera name.
 - 4) Storage container used.
 - 5) Used space.
 - 6) Live FPS.
 - 7) Recording FPS.
 - 8) Live video format.
 - 9) Recording video format.
 - 10) Media data received.
 - d. Historical Reporting: On-screen and PDF report of historical performance data going back 30 days.
 3. Monitoring Multiple Servers and Federated Systems: Provide multiple dockable tabs in full viewing client with system performance and use information for different servers and federated systems.
- C. Application Workspace Optimization:
1. Options for optimizing application workspaces in the management client software:
 - a. Application Layout: Rearranging layout via drag-and-drop.
 - b. Management Client Profiles:
 - 1) Centralized management of application options for optimization application for different user categories and skill levels.
 - 2) Ability to tailor the availability of main/sub functions for different user roles.
 2. Options for optimizing application workspaces in the full viewing client software:
 - a. General: Control general look and feel and navigation properties, such as color mode, camera title bar, grid sizes.
 - b. Personal or Centrally Enforced: Optimization can either be made as individual personalization managed by each operator, or centrally enforced using full viewing client profiles.
 - c. View Layouts: Availability of specific view layouts enforced using full viewing client profiles.
 - d. Themes: User interface color schemes enabling user choice of dark or light themes.
 - e. Control Panes Availability: Control availability of control panes and functions in live and playback tabs, and in setup mode.
 - f. Timeline Information: Control information included in timeline in playback tab.
 - g. Export Behavior: Control behavior and availability of export function.
 - h. Keyboard and Joystick Setup: Setup of keyboard short cuts and joystick controls.
 - i. Alarm and Access Control Notifications: Control behavior of alarms and access control notifications.
 - j. Application Language: Control application language.

- k. Advanced Application Settings: Control advanced application settings such as use of multicast, hardware acceleration, adaptive streaming, videos diagnostics overlay and time zone settings.
- D. Device Discovery and Management:
- 1. Add Hardware wizard to automatically discover and upon approval add devices to system using Universal Plug and Play (UPnP) discovery, IP network range scanning, or manual device detection. User ability to perform initial setup of credentials on devices without factory default credentials detected. Must be supported for Axis, Bosch, Hanwha Techwin, and for ONVIF profile Q conformant devices.
 - 2. Replace Hardware wizard for swift replacement of malfunctioning devices with preservation of configuration settings and recordings, including those for attached cameras, microphones, speakers, inputs, outputs, and metadata devices.
 - 3. Move Hardware wizard for moving devices and related devices from one recording server to another during runtime with no loss of settings, recordings, rules, permissions etc.
 - 4. User ability to enable and disable devices for purposes of maintenance or temporary deactivation.
 - 5. User ability to change the password of one or multiple devices based on a pre-configured time interval. Must be supported for Axis, Bosch, Canon, Hanwha Techwin, Hikvision, Panasonic, Sony, and ONVIF-compliant devices.
 - 6. User ability to upgrade the firmware of one or multiple devices, based on groups of devices. Must be supported for Axis, Bosh, Hanwha, Techwin and ONVIF.
 - a. For ONVIF Profile T & Q compliant devices. User ability to manage a VMS user account that communicates with a device. Add a user, list an existing user, and delete a user.
 - b. For ONVIF Profile T & Q compliant devices. User ability to manage network configuration. Change IP address, subnet mask, and default gateway.
- E. Camera Image and Video Stream Management: Adjustment of per-camera and per-video stream settings, with each camera allowed one or more streams for live viewing and one stream for recording, including an optional per-camera or per-camera-group preview window:
- 1. Per Camera:
 - a. General Settings: Change all camera specific general settings such as brightness, color level, compression, maximumbit rate, resolution, and image rotation.
 - b. Camera Video Stream Settings: Define as many different streams as specific camera support. Change individual stream settings such as FPS, resolution, image quality, video encoding format and resolution.
 - 2. Per Camera Group:
 - a. General Settings: Change all common camera specific general settings for the camera group such as brightness, color level, compression, maximumbit rate, resolution, and image rotation.
 - b. Camera Video Stream Settings: Define as many different streams as specific camera support for the camera group. Change individual stream settings such as FPS, resolution, image quality, video encoding format and resolution.
 - c. One camera can be associated to multiple camera groups.
 - 3. Video Streams: Define one camera video stream used for recording and multiple cameras video streams to be used for live viewing.

4. Recording: Manage recording functionality including:
 - a. Related device recording.
 - b. Manual recording timer.
 - c. Pre-buffer use.
 - d. Recording framerate.
 - e. Media storage assignment.
 - f. Automatic retrieval of edge recordings.
 5. Fisheye Lens Viewing: Capability for fisheye lens camera views provided through utilization of panomorph lens technology.
 6. Motion Detection: Manage motion detection functionality including:
 - a. Motion sensitivity.
 - b. Processing all frames or keyframes only.
 - c. Generation of motion metadata for smart search.
 - d. Exclusion zones.
 7. Camera Events: Define which camera events will be forwarded to the VMS.
 8. Client Settings: Define client related functionality including:
 - a. Use multicast for live stream.
 - b. Related devices.
 - c. Keyboard shortcut.
 9. Privacy Masks: Permanent and liftable system-defined camera image privacy masks hide certain areas in the camera image for live view, recording, and video export.
 - a. Permanent Masks: Allow a system admin to mask areas in cameras at all times and for all users. Permanently masked areas cannot be revealed once recorded.
 - b. Liftable Masks: Allows a system admin to establish default mask areas in cameras at all times and for all users, but with the option to sufficiently privileged operators to temporarily remove the masks for authorized users if needed – such as during investigation.
 - c. Masking Level: When establishing a privacy mask, system admins may select a mask level on a scale between 'light blur' to 'solid grey'.
- F. PTZ Camera Control: Camera-based and system-based PTZ camera control including the following capabilities.
1. Camera PTZ preset positions: Camera-based PTZ presets may be imported from the camera and renamed for use in system-based manual and automatic PTZ control.
 2. Automated Use of PTZ Presets: Scheduled and event-based rules capability to move PTZ cameras to pre-set positions.
 3. System-Based PTZ Preset Positions: System-based PTZ presets are definable for use in system-based manual and automatic PTZ control.
 4. PTZ Patrolling: Multiple per-camera PTZ patrolling schemes may be defined with the following options:
 - a. Adjustable wait times between preset position changes.
 - b. Disabling of motion detection to avoid false detection alarms.
 - c. Multiple patrolling schedules per camera per day, with different schedule for days, nights and weekends.

2.7 EVENT AND ALARM MANAGEMENT

- A. Provide rules for automating of different aspects of the system, including camera control, system behavior and external devices, based on events or time profiles, or a combination of events and time profiles.
1. Provide a Microsoft-Outlook-style configuration dialog where pre-defined and custom-defined events are used in rules to trigger actions.
 - a. Organize events into the following categories:
 - 1) Physical hardware devices connected to the system.
 - 2) Certain functions and states of devices available via connected hardware devices.
 - 3) Relating to VMS integrations.
 - 4) Archiving, failover, and database functions.
 - 5) From integrated analytics applications and systems.
 - 6) Custom-configured events enabling users to manually trigger actions and events in the system.
 2. Triggering events may initiate a wide set of system actions, including, but not limited to:
 - a. Control start and stop of recording, including scheduled and event-based recording.
 - b. Change camera stream properties.
 - c. Change of video wall content and layout.
 - d. PTZ camera preset positions and patrols.
 - e. Event-based notifications, including email notifications to single or multiple recipients with optional attachment of a camera still image or AVI video clip.
 - f. External system interactions
 - g. Bookmark creation.
 - h. Play pre-recorded audio.
 - i. Retrieve video and audio from edge storage devices and video from interconnected systems.
 - j. Single rule allows for executing multiple system actions.
 - k. Rule actions shall be triggered by event, time interval or a combination of event and time.
 - l. Rules shall be optionally stopped by event or after a specified time.
 - m. Unrestricted number of rules.
- B. Provide the following time profile functionality for use with profiles, rules, and triggers:
1. Dynamic day-length time profile that follows daylight changes over a year including Daylight Savings Time for a given location defined by a GPS position.
 2. Time profiles contain one, or more, single, or recurring periods of time.
 3. A single time period may span one or more days, defined by a starting date and time and an ending date and time.
 4. A recurring period of time is defined as a time range with recurrence pattern and range:
 - a. Time range is a starting and ending time within a day.
 - b. Recurrence pattern may be Daily, Weekly, Monthly or Yearly.
 - c. Recurrent range is a starting and ending date, or a starting date with a duration in days.
 5. Unrestricted number of time profiles.

- C. Provide central management of all internal system alarms and external security alarms. Events are pre-defined or user-specified incidents on the VMS that can be set up to trigger an alarm, including analytics events and manual control actions. Event and alarm management capabilities shall include but not be limited to:

1. Alarm Data Settings:

- a. Customizable alarm priorities, status, and categories to enable alignment of the alarm handling workflow with existing workflows and security systems.
- b. Optional sound notifications for different alarm priorities for notification of new incoming alarms.
- c. Manage which alarm priorities trigger desktop notifications for alarms.
- d. Manage which alarm data are shown in the Alarm Manager, including but not limited to:
 - 1) ID.
 - 2) Image.
 - 3) Location.
 - 4) Message.
 - 5) Owner.
 - 6) Priority Level.
 - 7) Source.
 - 8) State Level.
 - 9) State Name.
 - 10) Time.
- e. Optional Reasons for Closing to be chosen when an alarm is closed.
- f. Add audio files in wav-format to be used as alarm notification sounds.
- g. Manage how long alarms instances are kept in the system before being automatically deleted.

2. Alarm Configuration:

- a. User-definable alarm descriptions and work instructions.
- b. Select triggering event and source.
- c. Alarm time profiles specifying that response actions must take place within the specified time profile.
- d. Select start and stop events specifying that response actions must take place within the specified event window.
- e. Select a user defined event to be triggered if an alarm is not acknowledged within a defined time limit.
- f. Association of alarms with one or more cameras, with automatic display of camera video in the alarm preview window, with a minimum of 15 cameras showing simultaneously in the alarm preview window.
- g. Association of alarms to maps.
- h. Association of initial alarm owner (individual user or group) and priority.
- i. Association of alarm category.
- j. Select user defined event to be triggered by the alarm.
- k. Enable or disable desktop notifications for alarms.

3. Alarm Manager:

- a. Alarm list with extensive sorting and filtering capabilities.
- b. Instant preview of recorded video from primary and related cameras, at the time of the incident.

- c. Thumbnail image from primary camera, at the time of the incident.
 - d. Alarm disabling option shall enable users to suppress alarms from a given device for a specified time period.
 - e. Common alarm list for all interconnected systems and cameras.
 - f. Common alarm list for all sites in a Federated Architecture.
 - g. Alarm handling reports providing information about alarm inflow and alarm handling performance.
4. Alarm Handling:
- a. Instant preview live video of primary camera.
 - b. Instant preview of recorded video from primary and related cameras, at the time of the incident.
 - c. Option to select any related cameras to be displayed in the live and playback view items.
 - d. Present the alarm work instructions.
 - e. Change priority and status of the alarm.
 - f. Alarm escalation with option to forward alarms to operators with appropriate skills to handle specific types of alarms.
 - g. Present time logged alarm activities.
 - h. Add time logged comments to the alarm incident.
 - i. Desktop notifications shall allow immediate access to alarm handling.
5. Map Integration:
- a. Present incident location automatically on the map allowing operators to view and acknowledge active alarms.
 - b. All other map functionality must be available when viewing maps in the Alarm Manager.
6. Smart Map integration:
- a. Present incident location automatically on the smart map allowing operators to view and acknowledge active alarms.
7. Cameras with active alarms shall be visualized when viewing the geographic location of search results in the Centralized Search workspace. Web Client: Provide the following alarm list, alarm handling and investigation functionality:
- a. Alarm List:
 - 1) Alarm list with filtering capabilities:
 - a) All or personal alarms.
 - b) All or specific alarm states.
 - c) All or specific alarm priorities.
 - 2) Thumbnail image from primary camera, at the time of the incident.
 - 3) Click to handle alarm.
 - b. Alarm Handling:
 - 1) Instant preview of recorded video from primary and related cameras, at the time of the incident. Available incoming audio for cameras that have related microphones.
 - 2) Present the alarm work instructions.
 - 3) Change priority and status of the alarm.

- 4) Alarm escalation with option to forward alarms to operators with appropriate skills to handle specific types of alarms.
8. Mobile Client: Provide the following alarm notification, alarm list, alarm handling and investigation functionality:
 - a. Alarm Notification: Receive alarm notifications using Push Notifications. Notifications include access to:
 - 1) Video.
 - 2) Alarm information.
 - 3) Work instructions.
 - b. Alarm List:
 - 1) Alarm list with filtering capabilities:
 - a) All or personal alarms.
 - b) All or specific alarm states.
 - c) All or specific alarm priorities.
 - 2) Thumbnail image from primary camera, at the time of the incident.
 - 3) Click to handle alarm.
 - c. Alarm Handling:
 - 1) Instant preview of recorded video from primary and related cameras, at the time of the incident.
 - 2) Present the alarm work instructions.
 - 3) Change priority and status of the alarm.
 - 4) Alarm escalation with option to forward alarms to operators with appropriate skills to handle specific types of alarms.

2.8 VIDEO PROCESSING AND VIEWING

- A. Multiple Monitor Support: Support multiple monitors where each monitor shall show multiple floating or full-screen windows for display of views or individual view items.
- B. View Window Aspect Ratios: Support multiple views optimized for 4:3 and 16:9 display settings in both landscape and portrait orientations.
- C. Private or Shared Views: Private views can only be access by the user who created them. Views may be shared generally and available to all roles or restricted to specific roles.

Viewing of a content item in a shared view is subject to the viewer's permissions relating to the content item.

- D. View Groups: View groups facilitate view navigation and simplify searching across multiple views by narrowing search scope.
- E. View Layout Persistence: Same view layout in both live and playback modes.
- F. View Arrange and Restore: Support simple drag-and-drop re-arrangement of cameras in views for optimized monitoring of incidents, including replacement of individual cameras with different cameras, with single-click restore of original view layout.
- G. View Creation: Views that display up to 100 view items including cameras, web pages, still images, text, and interactive items. View capabilities include, but are not limited to:
 - 1. Camera View Item: Live and recorded camera video displayed in resizable view windows, utilized in several workspaces within the application. Each camera view item contains the following:
 - a. Video Status Indicator: A round dot indicating one of four states:
 - 1) Green: A connection to the camera is established.
 - 2) Red: Video from the camera is being recorded.
 - 3) Yellow: Playing back recorded video.
 - 4) Gray: The video has not changed for more than two seconds.
 - b. Motion Indicator: An icon of a moving person that appears only when motion is detected since it was last cleared.
 - c. Bounding-Box Display: Display of metadata bounding boxes as provided by supported cameras and integrated analytics in live and playback views.
 - d. Update on motion only: Optimizes CPU use by allowing motion detection to control whether the image should be decoded and displayed.
 - e. PTZ Camera View Item: PTZ camera view item can be configured to provide virtual joystick camera control and PTZ navigation overlay buttons on the video image.
 - f. Overlay Buttons: Used to add manually controlled speakers, events, outputs, PTZ cameras and to start/stop recording.
 - 2. Carousel: Allow a specific view item to automatically sequence rotate through pre-defined set of cameras that are not necessarily present in the view at the same time. Operators may select default or custom display times for each camera, and they are able to manually switch to the next or previous camera in the carousel list.
 - 3. Hotspot: Global hotspot function shall allow users to work in detail with any camera selected from any view. Local hotspot function shall allow users to work in detail with a camera selected from the same view.
 - 4. HTML Page: Show interactive HTML page.
 - 5. Image: Show a still image.
 - 6. Matrix: Shows live video from multiple cameras in any view layout with customizable rotation paths, remotely controlled by the computers sending matrix remote commands.
 - 7. Navigable Map Pages: Static or active map pages may be used to provide a good overview of premises, and for switching between different views, such as map page displaying a floor plan.
 - 8. Text: Add text.
 - 9. Video Wall: Display video wall control providing the following functionality:
 - a. Show monitor layout of currently selected video wall.
 - b. Drag-and-drop views to any monitor.

- c. Drag-and-drop cameras to any view item location in any monitor.
 - d. Change video wall via dropdown.
 - e. Activate video wall preset via dropdown.
- 10. 3rd party plug-ins: Add 3rd party plug-ins to extend the behavior of full viewing client.
- H. Live Video: Views provide camera live viewing capabilities including, but not limited to:
 - 1. Live Viewing: View live video of camera view items on the Live tab.
 - 2. Manual PTZ Control: Manual PTZ control options:
 - a. Video overlaid PTZ control.
 - b. Joystick.
 - c. Virtual joystick function.
 - d. PTZ point-and-click control.
 - e. Reserve and release PTZ control.
 - f. PTZ preset positions.
 - g. Overlay buttons to activate PTZ preset positions.
 - h. PTZ zoom to a defined rectangle.
 - i. Start, stop, and pause patrolling.
 - j. View who has PTZ control and time to automatic release, including anonymous users.
 - 3. Stream Selection: Change to any defined live video stream.
 - a. Manual selection of defined live video stream.
 - b. Adaptive Streaming: Automatic selection of defined live video streams with the best match to the requested resolution.
 - 4. Send Video to Destination: Option to send current camera to the following destinations:
 - a. View item in an existing window.
 - b. New floating window.
 - c. View item in any defined video wall.
 - 5. Digital Zoom: Magnification of video to facilitate detail viewing.
 - 6. Bookmarks: Create quick or detailed bookmarks, to facilitate incident review and documentation.
 - a. System generated headline for quick bookmark.
 - b. Optional headline and description information for detailed bookmark.
 - 7. Independent Video Playback:
 - a. Playback of video in multiple camera view items, each on its own independent timeline.
 - b. Option to initiate playback mode and synchronizing playback timeline with current time in independent playback.
 - 8. Instant Change of Camera: Drag-and-drop placement of a different camera in a camera view item, instantly changes the content to video from the new camera, according to the camera view item's current timeline position.
 - 9. Smart Map: Enable quick navigation to smart map, showing the geographic location of the camera, even camera located on a specific level inside a multistory building.
 - 10. Centralized Search: Initiate Centralized Search for the camera in a new window.
 - 11. Manual Recording: Start and stop manual recording with automatic stop of recording after a configurable number of minutes.

- I. Video Playback: Views provide additional camera playback capabilities including, but not limited to:
 1. Playback: Time synchronized play back video of camera view items on the Playback tab.
 2. Navigation: Advanced video navigation includes:
 - a. Forward and backwards playback at different speeds:
 - 1) Playback Speeds: 1/4x, 1/2x, 1x, 2x, 4x, 8x, 16x.
 - 2) Instant Realtime Speed: Toggle 1x playback speed or selected playback speed.
 - b. Forward and backwards frame-by-frame.
 - c. Skip to next or previous recorded sequence.
 - d. Skip to beginning or end of recordings.
 - e. Jump to date/time.
 3. Timeline: An overview of recorded sequences and bookmarks via integrated video timeline with time navigation and playback controls, including the following functionality:
 - a. Timeline Video Playback: Video from multiple camera view items integrated to a common video timeline, with common timeline control from any of the integrated camera view item.
 - b. Single and Consolidated Timeline: Two timelines with the first showing overview of selected camera view item and second showing a consolidated overview of all camera view items in the view.
 - c. Timeline Period: Select which period timeline covers.
 - 1) 5, 10, 20 minutes.
 - 2) 1, 2, 4, 8, 12, 16, 20 hours.
 - 3) 1, 2, 4 days.
 - 4) 1, 2, 4 weeks.
 - d. Recorded Sequences Overview: Recorded sequences of video and audio are shown in the timeline. The timeline displaying light-red to indicate recording, red for motion, light-green for incoming audio, and green for outgoing audio. If there are additional sources of data available, these are displayed as other colors.
 - e. Bookmarks Overview: Bookmarks are shown in the timeline with instant preview of the recorded video.
 - f. Integrated Time Interval Selection: Integrated function to select a time interval for export, evidence lock or video and audio retrieval from edge storage devices and interconnected systems.
 - 1) Visual selection on timeline.
 - 2) Select start and end date/time.
 - 3) Loop selected period on playback.
 - g. Multi-Window Timeline: Ability to use one timeline to control playback of cameras in multiple view windows.
 4. Recording Search: Search listing of camera sequences or bookmarks.
 - a. Preview: Search results may be previewed.
 - b. Print: Print of still image from the selected video clip may be initiated.
 - c. Export: Export of selected video clips may be initiated, reducing time needed to prepare forensic video material.

- J. Send View Item to Video Wall: Option to send current view item content to any defined video wall.
 - 1. Smart Map: Send smart map to video wall with the current geographic location, zoom level, and layers.
- K. Two-Way Audio: Audio from cameras with built-in or attached microphones can be configured for listening. Camera built-in or attached speakers can be configured for use to talk to individuals near speakers. Additional capabilities include:
 - 1. Broadcast: Broad announcements can be made by selecting the All Speakers option when talking.
 - 2. Lock to Selected Audio Devices: Enables continued use of microphones and speakers from selected cameras, while viewing video from a different set of cameras. This enables, for example, informing an individual at risk about the safety status of nearby areas.
 - 3. Level Meter: Level meter indicates the volume of the speaking operator's voice, to indicate whether the operator is at a correct distance from the microphone.
- L. Centralized Search: Shall enable users to apply multiple search categories and filters to find recording sequences, bookmarks, recordings with motion, alarms, events, vehicles, people, location, and data from third-party systems. Logical operators shall enable users to match any or all the search categories. From the search results, users shall be able to preview video and perform various actions, e.g., by exporting the search results or sending the search results to PDF. The search results shall be presented instantly as thumbnail images:
 - 1. Sequence Search: Search in recording sequences on one or more cameras.
 - 2. Motion Search: Search for sequences with motion, or Smart Search for motion in selected areas on one or more cameras.
 - 3. Bookmark Search: Search for bookmark headlines or descriptions.
 - 4. Alarms and Events Search: Search for alarms and events, with the ability to apply filters to refine the search results.
 - 5. Location Search: Search for recording sequences recorded at specific geographic locations. Shall only be available for cameras that provide ONVIF compliant video streams containing metadata about location.
 - 6. People Search: Search for people, with the ability to apply filters to refine the search results, including age, face, gender, and height. Shall only be available for cameras that provide ONVIF compliant video streams containing metadata about people.
 - 7. Vehicle Search: Search for vehicles, with the ability to apply filters to refine the search results, including license plate, country code, color, speed, and vehicle type. Shall only be available for cameras that provide ONVIF compliant video streams containing metadata about vehicles.
 - 8. Third-party Systems Search: Search for metadata from integrated third-party systems.
 - 9. Sorting By Relevance: The ability to sort search results by relevance:
 - a. One or no search categories: The search result with the newest event time shall be displayed first.
 - b. Multiple search categories combined with logical operator OR: The search result with most matching search categories shall be displayed first.
 - c. Multiple search categories combined with logical operator AND: The search result with most event times shall be displayed first.
 - 10. Save Search: The ability to save searches for reuse:
 - a. Save searches.

- b. Search for and open saved searches.
 - c. Edit saved searches.
 - d. Delete saved searches.
- 11. Navigation: Ability to jump to search results through a clickable timeline, or the ability to scroll through the search results.
- 12. Preview: Selected sequence previews with auto play and direct export support.
- M. Video Export and Documentation: Full viewing client options for video export and documentation include, but are not limited to:
 - 1. Snapshot: Produce instant visual documentation of a camera by saving the camera image to a file.
 - 2. Print: Produce instant visual documentation of a camera by sending it directly to a printer.
 - 3. Storyboarding: The storyboarding function makes it possible to include video sequences from different or overlapping time intervals from different cameras in the one and the same export.
 - 4. Export Database Format: Export in database format; including the standalone Full Viewing Client – Player application for simple instant viewing by authorities.
 - 5. Export Preview: Review video just prior to export, with looped playback option.
 - 6. Export Other Formats: Create evidence material in media player format (AVI files), MKV format, or still image format (JPEG images).
 - 7. Re-Export: Re-Export allows an authorized individual to export a digitally signed selection from the original video exported. Option to disable re-export, during initial export to database format, prevents undesirable re-distribution of sensitive video recordings.
 - 8. Bulk Export: In a single step, export in multiple formats to multiple destinations, including direct export to optical media, to ensure consistency across exported video sequences in various formats, and reduce human error possibilities.
 - 9. Export of Comments: Two video formats support inclusion of comments in exported video:
 - a. Database Format: Include general and/or camera-specific comments to a video export file.
 - b. Media Player Format: Include comments as pre/post slides.
 - 10. Video Incident Report Printing: Utilize still images rather than clips to print incident reports including images, surveillance details and free-text user comments.

2.9 MAPS

- A. Maps: Provide multi-layered physical overview of surveillance video coverage, with interactive access to and control of the VMS and related devices, including the following elements:
 - 1. Map Images: Illustrated maps or photographs. Supported image file formats are BMP, GIF, JPEG, JPG, PNG, TIF, TIFF, and WMP.
 - 2. Camera Icons: Indicate camera locations on the map. Fixed camera icons show camera view as colored angle radiating from the camera. PTZ camera icons show preset camera views as colored angles radiating from the camera.
 - a. Live Preview: Hover mouse pointer over camera icon to display a live preview in a resizable window.
 - b. PTZ Preset Navigation: Click on PTZ preset view zone moves camera to the preset position.

3. Microphone Icons: Microphone icons show microphone locations on the map.
 - a. Live Listening: Place mouse over microphone icon; press and hold left mouse button to listen to incoming audio from microphone.
 4. Speaker Icons: Indicate speaker locations on the map.
 - a. Live Speaking: Place mouse over speaker icon; press and hold left mouse button to talk through speaker.
 5. Control Icons: Icons to use for control of objects such as doors, gates, and lights.
 6. Hot Zones: Hot zones to provide vertical navigation through a hierarchy of maps by clicking on a hot zone.
 7. Map Overview Window: Navigable overview of map hierarchy set up in full viewing client.
 8. Video Wall Integration: Drag-and-drop integration of maps with video wall.
 9. Map Image Updates: When map images are replaced by an updated version of the map image of the same scale, map icons and other elements are kept in their original locations.
 10. Map Display Information: Information display options include but are not limited to:
 - a. Real-time status monitoring indication from all system components including cameras, I/O devices and system servers.
 - b. Graphical visualization of the system status through color coding.
 - c. Hierarchical propagation of status indications to higher ordered maps.
 - d. Different levels of status indications available (alarm, warning and errors).
 - e. System performance data for cameras and servers including camera resolution, FPS, network use and disk space.
 - f. Ability to suppress status indications (such as alarms and operational status) for a given device.
 - g. Editable device names in map and map-specific names and references assignable to devices in Map, subject to user permissions.
- B. Smart Map: Provide a geographic information system to accurately reflect geography in the real world, enabling access to cameras, microphones, input devices and alarms at multiple locations around the world. Differentiate from Maps, which utilize a different map for each location, by providing the complete picture in a single view, with seamless drilldown across different map layers. Include the following capabilities:
1. GIS Map Services: Supported services shall include Milestone, Bing, Google and OpenStreetMap map services.
 - a. Offline OpenStreetMap Map Service: Support the use of owner provided OpenStreetMap server for offline use.
 2. Geo-referenced Map Elements: Shapefiles, CAD drawings, such as DWG and DXF files, and buildings with multiple floor levels shall be supported.
 3. Default World Map: Standard world geographic background containing geo-reference data but not containing geographic reference features such as county boundaries, and cities.
 4. Map Layers: Map data layers whose display may be toggled on and off, including but not limited to: Camera name and field of view, quick links, street names, and building and business names.
 5. Camera Selection: Capabilities include:
 - a. Instant one-click camera preview in floating view of up to 25 cameras.

- b. Easy multi-camera selection within camera preview.
 - c. Easy drag-and-drop and point-and-click definition of cameras, camera field of view. Changing cameras placement, direction and field of view automatically update camera position information.
 - d. Selection of 10 different camera icons.
 - e. Depiction of camera field of view on map.
6. Camera And Device Aggregation: Aggregated cameras and other devices shall be grouped visually to preserve the overview when multiple cameras or other devices are closely located.
- a. Ability to view the number and types of devices inside the grouping.
 - b. Ability to zoom to a zoom level that shows all the cameras and devices inside the grouping, including sub-groupings.
7. Device Naming: Administrators may name edit devices in a map and assign map-specific names and references to devices in a map.
8. Navigation: Easy drag-and-drop and point-and-click definition of:
- a. Location Links: Location links shall enable quick navigation across different sites and locations.
 - a. Quick Links: Quick links shall enable drilldown to existing classic full viewing client maps.
 - b. Building Navigation: Navigation between different floors in buildings with multiple levels, where only camera related to the specific floor level are presented.

2.10 MEDIA STORAGE MANAGEMENT

- A. Provide multiple media storage containers definable with the following characteristics:
- 1. Container: Each container consists of a live database and optionally one or more archive databases, with container-specific archiving and grooming schemes and retention times. Archive database can reside on the same disk as the live database or on secondary disks or network drives.
 - 2. Capacity: Maximum recording capacity shall be limited only by available disk space or configured container storage limit.
 - 3. Device Assignment: Recording of each device is assigned to a specific storage container. The assigned storage container for a device or group of devices may be changed from one container to another.
 - 4. Archiving: Recorded video data may be automatically moved from a container's live database storage to its archived storage. Archived data is still online and available to client software.
 - 5. Grooming: Video data grooming possibility to enable reduction of video recording data size by reducing the frame rate of the video data when archiving.
 - 6. Maximum Recording Times: Maximum recording times may be set for manual recordings, with VMS deleting older video to free up storage for newer video.
- B. Edge Video Storage: Provide utilization of camera-based storage including the following capabilities:
- 1. Video and Audio Retrieval: Retrieving video and audio recordings across low-bandwidth connections based on time profiles, events, or manual requests.
 - 2. Video and Audio Consolidation: Consolidating video and audio from multiple storage mechanisms:

- a. Seamless merging of video and audio stored centrally in media database, and video and audio retrieved from associated camera edge storage, or from an interconnected system.
 - b. Optionally consolidate pre-event images recorded locally in camera or video encoder.
3. Scalable Video Quality Recording (SVQR): Capability to record high quality video using edge storage and record low quality video centrally, to minimize network bandwidth utilization, using the capabilities described above. High quality video can be retrieved when needed, on an event-driven, scheduled, or manual basis.
- C. Evidence Lock: Provide capabilities for assuring the availability of recorded video selected for evidentiary use, including:
 1. Extension of Video Retention: Manual extension of video retention time for a selected set of cameras, and its related devices, in a given time interval, where the operator selects an extended retention time from a pre-defined set of retention time options.
 2. Video Sequence Metadata: Users may add headline and comments information to locked video sequences to enhance their manageability.
 3. Management of Locked Video Sequences: Search, filter and listing functions including editing comments, modifying extended retention time, and removing an evidence lock.
 4. Locked Video Export: Locked video may be exported through a single step operation.

2.11 MOBILE SERVER

- A. User Authentication: Facilitate the following methods of user authentication:
 1. Basic Authentication: Basic user VMS account.
 2. Windows Authentication: Via Active Directory or local Windows user account. Possible to use current Windows user to facilitate single sign-on.
 3. Two-Step Verification: In addition to login capabilities, provide two-step authentication via a verification code transmitted to the user's registered email address, with a five-minute timeout for verification code expiration, and a user login block for exceeding the maximum number of failed code entry attempts, which defaults to three but may be adjusted.
- B. Dynamic Bandwidth Optimization: Optimize camera video stream from server to client to make optimum use of bandwidth.
- C. Bookmarks: Enable the use of bookmarks in live video and recorded video.
- D. Smart Connect: Easy configuration of internet access to the mobile server by automatic configuration of firewalls and internet routers via UPnP, with verification of configuration and operation of internet connection, with option to email connection details to mobile client users. Includes automatic mobile server on LAN via UPnP.

2.12 WEB CLIENT

- A. Provide the following browser-based capabilities:
 1. User Authentication:
 - a. Require only username and password.
 - b. Enable basic users to change password during login.
 - c. Support two-step verification.
 - d. User authentication and authorization is handled by mobile server.

2. Inherit System Views: Automatically obtain the user's private and shared views configuration from the system.
3. All-Camera View: Automatically generate a view for all cameras when no views are set up.
4. Two-Way Audio: Audio from cameras with built-in or attached microphones can be configured for listening. Camera built-in or attached speakers can be configured for use to talk to individuals near speakers. Audio playback shall be available for investigations, video exports and alarms. Additional capabilities include:
 - a. Broadcast: Broad announcements can be made by selecting a microphone icon on the view level when talking.
 - b. Use the Push-to-talk (PTT) Feature: Communicate via the VMS system, through a PC microphone and while watching live video from one camera, with people near a video camera with audio equipment. Push-to-talk (PTT) is also available in Actions.
5. Live Video Monitoring: View live video with PTZ control including use of presets, video playback, and triggering of camera-related outputs and events from within the camera's view.
6. Search: Search function to find cameras, types of camera, cameras with related microphones, cameras with related speakers and camera views.
7. Video Export: Provide video export, with the option to preview and store exported video on the server, and make it available for later usage or download, for example, when a higher-bandwidth connection is in use:
 - a. AVI, MKV, Database Format files: Ability to create AVI, MKV or database format export files.
 - b. Still Image Export: Provide camera view JPEG image export.
 - c. Audio: Option to include audio in the export package.
 - d. Export On Server: Ability to export on the server to avoid moving large files.
 - e. Exceed Retention Time: Ability to store video recordings for a period that is longer than the retention time.
 - f. Play Back Deleted Recordings: Ability to play back the recordings even if the recordings have been deleted from the media database.
 - g. Reduced Download: Ability to download only needed files or save them for downloading when on a faster connection.
 - h. Preview On Server: Preview exports on the server without downloading them.
8. Data Integrity of Exported Video:
 - a. Encryption And Password Protection: Option to encrypt and password protect any of the available export formats.
 - b. 256-bit AES Encryption: Ability to encrypt exports using 256-bit AES algorithm.
 - c. Digital Signature: Digitally signed media exports with SHA-2 algorithm to establish a means of detecting modification of exported video.
9. Bookmarks: Ability to create quick or detailed bookmarks to facilitate incident review and documentation. Bookmarks shall be applicable for live video and recorded video.
10. Secure Connection: Connect to mobile server through trusted CA certificates for HTTPS encryption.
11. Supported Browsers:
 - a. Microsoft Internet Explorer
 - b. Microsoft Edge
 - c. Safari

- d. Google Chrome
- e. Mozilla Firefox

12. Browser Plug-Ins or Extensions: No plug-ins or extensions to be installed.

2.13 MOBILE CLIENT

A. Provide the following native-app mobile client capabilities:

1. User Authentication:
 - a. Require only username and password.
 - b. Enable basic users to change password during login.
 - c. Support two-step verification.
 - d. User authentication and authorization is handled by mobile server.
2. Multiple Server Profiles: Select between multiple server profiles to facilitate easily switching between sites or different connection addresses.
3. Views and View Groups: Automatically obtain the user's private and shared views from the system to be used as camera lists.
 - a. View Groups: Views shall be organized in view group folders. View groups shall also have the capability of organizing subordinate view groups.
 - b. All-Camera View: Automatically generate a view for all cameras when no views are set up.
4. Two-Way Audio: Audio from cameras with built-in or attached microphones can be configured for listening. Camera built-in or attached speakers can be configured for use to talk to individuals near speakers. Audio playback shall be available for investigations and alarms. Additional capabilities include:
 - a. Use the Push-to-talk (PTT) Feature: Communicate via the VMS system, through the microphone of the mobile device and while watching live video from one camera, with people near a video camera with audio equipment. Push-to-talk (PTT) is also available in access control.
5. Full-Screen View: Display cameras in full screen to take better advantage of the mobile device's screen, with camera view navigation in full screen by swiping left or right.
6. Pinch-To-Zoom: Digital pinch-to-zoom shall enable mobile users to enlarge a part of the image for closer review and conduct detailed investigation of video.
7. Picture-In-Picture: Provide the following functionality for Picture-In-Picture:
 - a. Display a live picture-in-picture frame of the same camera when in playback mode.
 - b. The picture-in-picture shall be movable by dragging.
 - c. Double-tapping and will return to live view.
 - d. Hide live picture-in-picture frame.
8. Search: Search function to find cameras, types of camera, cameras with related microphones, cameras with related speakers, and camera views.
9. Navigation: Ability to navigate recorded video using a time picker and to adjust the start time by dragging a timeline scroller.
10. Bookmarks: Ability to create quick or detailed bookmarks to facilitate incident review and documentation. Bookmarks shall be applicable for live video and recorded video.
11. Mobile Video Push: Provide mobile client capability for mobile device users to use their mobile device cameras as cameras in the VMS, including the following characteristics.

- a. No Mobile Setup: No mobile device setup shall be required for mobile video push. Provide central server-side configuration.
 - b. Metadata Support: Mobile users shall be able to include metadata in the video submitted.
 - c. Audio: Mobile users shall be able to include audio in the video submitted.
12. Investigation: Provide access to investigations created in the web client.
 13. Secure Connection: Connect to XProtect Mobile server through trusted CA certificates for HTTPS encryption.
 14. Supported Mobile Operating Systems:
 - a. Android
 - b. iOS

2.14 SDK-BASED INTEGRATION

- A. Software Development Kit (SDK): The VMS shall support a software development kit (SDK) that allows integrating the video management system with third-party applications, for example access control and video analytics.
- B. Integration Types and Functionalities: Integration of third-party applications and plug-ins shall be possible in three different ways:
 1. Integration through network protocols shall allow for the possibility to choose coding platform. Protocol integration shall make it possible to:
 - a. Retrieve, save, and change the configuration of the VMS.
 - b. Retrieve live or recorded video, audio, and metadata.
 - c. Send control commands and events to the VMS.
 - d. Receive video management system status information, for example if a camera is down or a server is running out of space.
 - e. Implement protocols on Windows, Java® and Linux® systems.
 2. Integration through the .NET libraries which shall allow for using software components to integrate with the VMS. .NET integration shall make it possible to:
 - a. Retrieve, save, and change the configuration of the VMS.
 - b. Retrieve live and recorded audio and metadata.
 - c. Display live and recorded video with optional overlay of graphics.
 - d. Issue control commands to the video management system or related device, for example a camera with PTZ and outputs.
 - e. Send and receive events to the VMS.
 3. Integration through a plug-in embedded directly into the VMS environment that shall run as part of the VMS and client applications. Plug-in integration shall make it possible to:
 - a. Be integrated with the event server, enabling the event server to use plug-in functionality. This shall allow event-based functionality to be executed without the need for an open user interface.
 - b. Be integrated with the full viewing client, enabling the application to use plug-in functionality.
 - c. Be integrated with the management client, enabling the application to use plug-in functionality.
 - d. Plug-ins shall be able to run across all products and versions of the VMS.
 - e. Plug-ins shall be able to listen for events from other plug-ins.

- f. It shall be possible to activate licenses for third party plug-ins in the management client.
- C. Integration Capabilities: Third party applications shall be able to integrate with the VMS to access a variety of functionalities:
 - 1. Video, Audio, and Metadata Functionality:
 - a. Retrieve and play live and recorded video.
 - b. Retrieve and play live and recorded audio.
 - c. Retrieve and access live and recorded metadata.
 - d. Retrieve and display single images (JPEG).
 - e. Export video and audio in AVI, MKV and native database format.
 - f. Place overlay information on live and recorded video in component-based implementation and in plug-ins for the full viewing client.
 - g. Create, search for, and delete bookmarks.
 - 2. Configuration:
 - a. Retrieve and change VMS configuration, including camera, user and alarm information.
 - b. Enable third party applications to save and retrieve their own configuration.
 - 3. Authentication and Authorization. Logins and authorization of third-party plug-ins, applications, and protocol integrations:
 - a. Manage user rights on plug-in functionality.
 - b. A framework for system access and security token handling.
 - 4. Event and Alarms:
 - a. Trigger internal (system-related) and external (integrated) events and alarms.
 - b. A specific event can trigger start or stop recording.
 - c. Search for existing alarms and events.
 - d. Update and acknowledge alarms.
 - 5. Licensing. Read licenses and add own plug-in license:
 - a. Licensing of third-party integrations
 - b. Integration with online registration
 - 6. System status:
 - a. Receive all status messages from the video management system, including server disk, CPU usage, and triggered events.
 - 7. Control. Trigger output, control PTZ, start/stop recordings:
 - a. Send PTZ commands to cameras.
 - b. Retrieve PTZ position from absolute PTZ cameras.
 - c. Send a start or stop recording event from a specific event.
 - d. Set bookmarks in recording.
 - e. Activate external output.
 - f. Control video wall application functionality.
 - g. Send camera to a video-sharing monitor.
 - h. Send commands to third party-developed plug-ins.
 - i. Playback time controller.
 - j. Support for displaying plug-in items on smart map in full viewing client.
 - k. Change full viewing client theme

8. System and Audit logs. Generate log entries and reads logs:
 - a. Write and read systems and audit logs.

D. Use cases:

1. Compatibility with transactional add-on, which integrate video surveillance with automatic teller machines (ATM), point-of-sale (POS) and enterprise resource planning (ERP) systems for managing loss prevention and fraud.
2. Compatibility with LPR add-on for automatic reading and tracking of vehicle license plates.
3. Event integration via a simple message-based socket communication interface enabling external applications to trigger events in the VMS.
4. Functionality for external applications to trigger user-defined events in the VMS.

2.15 LICENSING

- A. VMS shall offer easy-to-use automatic or manual online activation via the Internet and alternatively, offline activation via email and web for closed surveillance networks.

B. Server Base License:

1. Require one mandatory server base license for installing the product.
2. Server base license shall permit the following deployments within the legal entity purchasing the base license:
 - a. Unrestricted number of management servers.
 - b. Unrestricted number of recording servers.
 - c. Unrestricted number of full viewing client, web client and mobile client applications.

C. Video Wall License:

1. Video wall license shall permit connection of an unrestricted number of video wall instances (including physical displays) and camera feeds.

D. Hardware Device License:

1. Require one license per hardware IP address to connect:
 - a. Cameras.
 - b. Audio devices.
 - c. Video encoders.
 - d. Other devices.
2. Support an unlimited number of hardware device licenses.

E. Licensing of Interconnect Functionality:

1. Require one interconnect device license per camera in an interconnected site that is enabled in the central system.
2. Interconnect license shall be tied to the parent system showing the interconnected devices.

F. Licensing of Federated Architecture:

1. The use of federated architecture is free and not subject to licensing. This implies that unrestricted sites and licensed cameras can be included in the federated hierarchy, without the need for additional or special licenses.

PART 3 - EXECUTION

3.1 GENERAL

- A. Provide necessary work as detailed on Section 28 00 00.

3.2 SITE INSPECTIONS

- A. Continuously verify that the site conditions agree with the Documents and the design package. Submit a report to the Architect documenting changes to the site or conditions that affect the 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. No deficiency shall be corrected without written permission from the Architect.
- B. Specific mounting locations, exact wire and cable runs, and conduit routing have not been specified or delineated on the Documents. Coordinate all aspects of the Work with the Architect.

3.3 COORDINATION

- A. Coordinate with the Architect to ensure that adequate conduit is provided, and that equipment back-boxes are adequate for System installation.
- B. Coordinate with the Architect to ensure that adequate power has been provided and properly located for the security System equipment.
- C. Coordinate locations of all devices with the Architect prior to installation.
- D. Coordinate and verify the location of each piece of rack-mounted equipment with the End-user.
- E. Coordinate custom SMS report requirements with the End-user. Submit report formats to the End-user for review and acceptance.
- F. Coordinate all initial database partitioning and setup with the End-user prior to initial programming and cardholder data entry.
- G. Coordinate finishes and colors of all equipment with the Architect. Submit all finish and graphics for all equipment in public areas to the Architect for approval prior to installation.

3.4 WARRANTY AND SUPPORT

- A. Manufacturer Warranty and Support:
 - 1. Software Warranty:
 - a. Manufacturer's software warranty must be described in the manufacturer's EULA for the product.
 - 2. Software Support:
 - a. Provide free access to any software service updates or hot fixes released due to a material defect or error in the product.

- b. Provide new device driver packs, multiple times per year, to extend support for additional devices without the need for a new version of the product.
- c. Provide free access to self-paced interactive e-training.
- 3. Software Updates and Upgrades:
 - a. Make software upgrades available for a period of one year from activation of the software license. Coverage options shall include:
 - 1) Free access to any new product versions for the purchased VMS software product.
 - 2) 100% credit on owners current VMS product when upgrading to a more advanced version of the same VMS product.
 - 3) Prioritized handling of support phone call response times based upon criticality of issue, for questions submitted by email or that cannot be answered in initial phone call.

3.5 SYSTEM PROGRAMMING AND DATA ENTRY

- B. Provide all initial System programming and setup of the VSS including, but not limited to the following:
 - 1. Initial setup for the interface with the SMS. The interface shall provide for automatic camera selection upon alarms within the SMS as defined in the Specification. Coordinate automatic camera selection, real-time record initialization, and recording status alarm annunciation requirements with the End-user prior to programming.
 - 2. Graphical Maps and Icons: Coordinate with the Architect to obtain AutoCAD architectural backgrounds for implementation as graphical maps. Import all AutoCAD background information provided by the Architect and produce a complete set of graphical maps depicting all VSS points.
 - 3. On-screen alphanumeric identification of each camera. Coordinate descriptors with the End-user prior to programming.
 - 4. Automatic selection of a camera adjacent to a Card Reader upon an invalid card use. Coordinate automatic camera selection requirements with the End-user prior to System programming.
 - 5. Automatic switching of recording from standby or reduced frame rate mode to real increased frame rate recording when an alarm occurs as defined herein.
- C. Enter all data needed to make the system fully operational. Deliver the data to the End-user on data entry forms, utilizing data from the Documents, Contractor's field surveys and all other pertinent information in the Contractor's possession required for complete installation of the database. Identify and request from the Architect any additional data needed to make the system fully operational and integrated. The completed forms shall be delivered to the End-user for review and approval at least 90 days prior to the Contractor's scheduled date.

END OF SECTION

SECTION 28 23 29

VIDEO SURVEILLANCE FIELD DEVICES

PART 1 - GENERAL

1.1 SUMMARY

- A. Applicable requirements of Division 01 - General Requirements and Division 28, Section 28 00 00 shall be considered a part of this section and shall have the same force as if printed herein full.
- B. The work to be done under this section of the Specifications shall include the furnishing of labor, material, equipment, and tools required for the complete installation of the work indicated on the Drawings, as specified herein, or as noted in other sections of Division 28 – Electronic Safety and Security.
- C. All materials, obviously a part of the electronic security infrastructure and necessary to its proper operation, but not specifically mentioned or shown on the Drawings, shall be furnished, and installed without additional charge.
- D. The Drawings and Specifications are complementary to each other and what is called for by one shall be as binding as if called for by both. If a discrepancy exists between the Drawings and Specifications, the higher cost and/or higher level of functionality shall be included to meet the design intent.
- E. Work and products provided must conform to the State of Delaware's Building Access Security Standard, SE-ACCESS-001. This standard as authorized by Delaware Law, Title 29, Chapter 90C mandates the use of specific technology and products to establish consistency in both quality and the security as well as interoperability.
- F. The security contractors must be an approved vendor with the Delaware Department of Technologies & Information (DTI) and currently certified on all security related systems. Submittals/work shall be restricted to vendors have met the minimum requirements and are listed as a security vendor by the manufacturers and approved by the Owner or their authorized representative. The work detailed in these specifications and associated drawings are an expansion of the Owner's existing Security Management System (SMS). The products utilized on this project must be fully and completely compatible and supported by the Owner's existing SMS with no exceptions.

1.2 RELATED SECTIONS

- A. 28 00 00 Electronic Safety and Security

1.3 WORK INCLUDED

- B. The work shall consist of turnkey system comprised of these core systems:
 - 1. Access Control System
 - 2. Security Communication Systems
 - 3. Video Surveillance System

4. Wire and cable to install all equipment as specified herein
5. Miscellaneous conduit, power supplies, and back boxes (not shown on the Documents as provided, but required for a complete installation)

PART 2 - PRODUCTS

2.1 GENERAL CAMERA REQUIREMENTS

- A. All products not provided by the end-user shall be new and unused and shall be of manufacturers current and standard production.
- B. Where two or more equipment items of the same kind are provided, all shall be identical and provided by the same manufacturer.
- C. Provide video surveillance camera housings and mounts as indicated on the documents and as specified for camera types herein.
- D. Wiring to all cameras shall pass from the back box through the mount and into the housing. Exposed wiring of any kind shall not be acceptable.
- E. Provide sun shields for camera housings in outdoor locations exposed directly to sunlight.
- F. Provide weather and dust proof camera housings with thermostatically controlled heaters and blowers in outdoor locations.

2.2 NETWORK DISTRIBUTION

- A. Cable runs, and any IP transmission shall be ANSI/TIA Category with matching RJ Cable for cameras shall ANSI/TIA Category UTP.
- A. 45 crimp type connectors, and shall be installed with a control crimp tool, specified by the connectors' manufacturer
- B. All video signals from cameras in the system shall be home run to the closest Security Equipment Room (SER) or Security Equipment Closet (SEC) and connected to the IP Network and recorded on the network video recorder. All camera cabling shall be pulled and terminated by the telecom cabling contractor Div. 27 within 4' of the intended camera location. The cabling from the Camera to the termination jack shall be provided by the Security contractor Div. 28.
- C. All IP products shall be powered by the switch utilizing the network cable. Power injectors (midspans) shall be provided by the contractor when required for proper operation.
- D. IP cameras with Edge recording SD card slots shall be supplied with no less than a 256 GB of storage.
- E. All camera systems provided shall include the programming, installation, integration, and licenses for all video system devices provided.

2.3 PAN/TILT/ZOOM (PTZ) ENVIRONMENTAL IP DOME CAMERA 40X OPTICAL ZOOM

- A. The specified product shall meet or exceed the following design specifications:

1. The product shall operate on an open source and Linux-based platform and include a built-in web server.
2. The product shall be equipped with an IR-sensitive progressive scan megapixel sensor.
3. The product shall provide a removable IR-cut filter, providing day/night functionality.
4. The product shall be equipped with a 4.25-170 mm lens with auto-iris and autofocus.
5. The product shall be equipped with a motorized 40x optical zoom lens, providing a horizontal field of view between 65.1 and 2.00 and a vertical field of view between 39.1 and 1.18.
6. The product shall be manufactured with a metal (aluminum) casing.
7. The product shall provide local video storage utilizing a SD/SDHC/SDXC memory card expansion.
8. The product shall be manufactured with an UV resistant IP66/67, NEMA 250 4X and IK10 rated polymer enclosure fitted with a fixed sunshield.
9. The product shall provide options for clear and smoked dome
10. The specified product shall meet or exceed the following performance specifications:
 - a. Illumination:
 - 1) The product shall meet or exceed the following illumination specifications:
 - a) Color:
 - i. 0.1 lux at 30 IRE, F1.6
 - ii. 0.15 lux at 50 IRE, F1.6
 - b) B/W:
 - i. 0.002 lux at 30 IRE, F1.6
 - ii. 0.003 lux at 50 IRE, F1.6
 - a. Resolution
 - 1) The product shall be designed to provide video streams in HDTV 1080p (1920x1080) at up to 60 frames per second (60Hz mode) or 50 frames per second (50Hz mode) using H.264, H.265 or Motion JPEG.
 - 2) The product shall support video resolutions including:
 - a) 1920x1080 (HDTV 1080p)
 - b) 1280x720 (HDTV 720p)
 - b. Encoding
 - 1) The product shall provide independently configured simultaneous H.264 and Motion JPEG streams.
 - 2) The product shall provide configurable compression levels.
 - 3) The product shall support standard baseline profile with motion estimation.
 - 4) The product shall support motion estimation in H.264/MPEG-4 Part 10/AVC.
 - 5) The product shall support the following video encoding algorithms:
 - a) Motion JPEG encoding in a selectable range from 1 up to 50/60 frames per second.
 - b) Baseline Profile H.264 encoding with motion estimation in up to 50/60 frames per second.
 - c) Main Profile H.265 encoding with motion estimation and context-adaptive binary arithmetic coding (CABAC) in up to 50/60 frames per second.
 - d) High Profile H.264 encoding with motion estimation up to 50/60 frames per second.
 - 1) The camera shall in H.264 and H.265 support combining Average Bit Rate (ABR) and Maximum Bit Rate (MBR)
 - 2) The camera shall be able to deliver predictable storage using Average Bit Rate (ABR) bitrate controlling algorithm based on a bitrate budget and selected retention time.

- a) The camera shall be able to deliver predictable storage using Average Bit Rate (ABR) bitrate controlling algorithm based on a bitrate budget and the selected retention time.
 - i. The ABR bitrate algorithm, depending on the bitrate budget and the selected retention time, shall adjust the bitrate to meet the bitrate budget over the whole retention time.
 - ii. The ABR algorithm shall have a method to keep the video quality even during busy periods by allowing the current bitrate to be significantly above the configured average bitrate during significant parts of the retention time.
 - b) The camera shall in H.264 and H.265 support flexible retention period for Average Bit Rate (ABR) algorithm up to 1 year.
 - c) When using Average Bit Rate (ABR) the camera shall keep bitrate history up to at least 30 days.
 - d) The camera shall in H.264 and H.265 support reuse of past Average Bit Rate (ABR) history if a stream is disconnected and the camera reconnects with the same basic stream parameters.
 - e) When using Average Bit Rate (ABR), the camera shall in H.264 and H.265 support multiple parallel streams with independent ABR-history.
 - f) The camera shall issue bitrate degradation events when using Average Bit Rate (ABR) if the configuration is predicted to be
 - i. unrealistic
 - ii. not fulfilling basic quality requirements
 - iii. not fulfilling the bitrate budget
- 3) The product shall support scene adaptive bitrate control with one of the following capabilities to lower bandwidth and storage:
- a) Automatic dynamic Region of Interest to reduce bitrate in unprioritized regions to lowering bandwidth and storage requirements.
 - b) Automatic dynamic Group of Pictures to lower bandwidth and storage requirements
 - c) Automatic dynamic Frames per Second to lower bandwidth and storage requirements
- c. Transmission
- 1) The product shall allow for video to be transported over:
 - a) HTTP (Unicast)
 - b) HTTPS (Unicast)
 - c) RTP (Unicast & Multicast)
 - d) RTP over RTSP (Unicast)
 - e) RTP over RTSP over HTTP (Unicast)
 - f) SRTP (Unicast & Multicast)
 - 2) The product shall support Quality of Service (QoS) to be able to prioritize traffic.
 - a) Image
 - 3) The product shall incorporate automatic and manual white balance.
 - 4) The product shall incorporate an electronic shutter operating in the range of 1/11000 s to 1/3 s.
 - 5) The product shall incorporate capture mode with the following settings:
 - a) HDTV 1080p (1920x1080) with WDR: 25/30 fps (50/60 Hz)
 - b) HDTV 1080p (1920x1080) without WDR: Up to 50/60 fps (50/60 Hz)
 - 6) The product shall incorporate forensic wide dynamic range functionality providing up to 120 dB dynamic range.

- 7) The product shall provide backlight compensation functionality.
- 8) The product shall support manually defined values for:
 - a) Saturation
 - b) Brightness
 - c) Sharpness
 - d) Contrast
- 9) The product shall incorporate a function for optimization of low light behavior.
- 10) The product shall allow for rotation of the image in steps of 180°.
- 11) The product shall incorporate automatic defog functionality.
- 12) IP addresses
 - a) The product shall support both fixed IP addresses and dynamically assigned IP addresses provided by a Dynamic Host Control Protocol (DHCP) server.
 - b) The product shall allow for automatic detection of the product based on UPnP and Bonjour when using a computer with an operating system supporting this feature.
 - c) The product shall provide support for both IPv4 and IPv6.
 - d) The camera shall provide support for IPv6 USGv6.
- d. PTZ functionality
 - 1) The product shall:
 - a) Provide digital PTZ functionality.
 - b) Provide more than 255 manually set preset positions.
 - c) Provide On-screen directional indicator (OSDI) functionality.
 - d) Be equipped with accurate pan and tilt functionality with a range of:
 - i. Pan: 360 endless
 - ii. Tilt: 220
 - e) Provide pan and tilt speed in a range of:
 - i. Pan: 0.05 - 450/sec
 - ii. Tilt: 0.05 - 450/sec
 - f) Provide optical and digital zoom functionality:
 - i. Optical zoom: 40x
 - ii. Digital zoom: 12x
 - g) Provide adjustable zoom speed.
 - h) Provide e-flip functionality, which will automatically rotate the image 180 electronically when following a moving object passing under the camera.
 - i) Provide a guard tour functionality which allows the dome to automatically move between selected presets using an individual speed and viewing time for each preset.
- e. Event functionality
 - 1) The product shall be equipped with an integrated event functionality:
 - a) Device status
 - i. Operating temperature
 - ii. Fan
 - iii. IP address
 - iv. Network lost
 - v. Shock detection
 - vi. Storage failure
 - vii. System ready
 - b) Edge storage

- i. Recording ongoing
 - ii. Storage disruption
 - c) I/O
 - i. Manual trigger
 - ii. Virtual inputs
 - d) PTZ
 - i. Malfunctioning
 - ii. Movement
 - iii. Preset position reached
 - iv. Ready
 - e) Scheduled and recurring
 - f) Video
 - i. Average bitrate degradation
 - ii. Live stream open
 - 2) Response to triggers shall include event actions:
 - a) Day and night mode
 - b) Guard tours
 - c) Upload of images and video clips: FTP, SFTP, HTTP, HTTPS, email, or network share
 - d) Send notification: email, HTTP, HTTPS, TCP, and SNMP trap
 - e) Overlay text
 - f) Preset positions
 - g) Record video: SD card and network share
 - h) Send SNMP trap message
 - 3) The product shall provide memory for pre- and post-alarm recordings.
- f. Edge storage
- 1) The product shall support continuous and event-controlled recording to:
 - a) Local memory added to the products SD-card slot
 - b) Network attached storage, located on the local network
 - 2) The product shall incorporate encryption functionality for the SD card (AES-XTS-Plain64-256bit).
 - 3) The product shall be able to detect and notify edge storage disruptions.
- g. Protocol
- 1) The product shall incorporate support for at least IPv4, IPv6, USGv6, ICMPv4/ICMPv6, HTTP, HTTPS, HTTP/2, SSL/TLS, QoS Layer 3 DiffServ, FTP, SFTP, CIFS/SMB, SMTP, mDNS (Bonjour), UPnP®, SNMP v1/v2c/v3 (MIB-II), DNS/DNSv6, DDNS, NTP, RTSP, RTP, SRTP, TCP, UDP, IGMPv1/v2/v3, RTCP, DHCPv4/v6, SOCKS, SSH, LLDP, CDP, MQTT v3.1.1, Syslog, Link-Local address (ZeroConf).
 - 2) The SMTP implementation shall include support for SMTP authentication.
- h. Text overlay
- 1) The product shall:
 - a) Provide embedded on-screen text with support for date & time, and a customer-specific text, product name, of at least 45 ASCII characters.
 - b) Provide the possibility to choose different font sizes for embedded on-screen text, and to use white or black text on at least four different backgrounds.
 - c) Provide the ability to manually set up and configure polygon privacy masks to the image.
 - d) Allow for the overlay of a graphical image, such as a logotype, into the image.

- i. Security
 - 1) The product shall support the following:
 - a) Secure web browsing
 - i. The use of HTTPS and SSL/TLS, providing the ability to upload signed certificates to encrypt and secure authentication and communication of both administration data and video streams.
 - ii. Restrict access to the built-in web server by usernames and passwords at three different levels.
 - b) Certificate management
 - i. Provide centralized certificate management, with both pre-installed CA certificates and the ability to upload additional CA certificates. The certificates shall be signed by an organization providing digital trust services.
 - c) Enhanced security features
 - i. The use of signed firmware validates the firmware's integrity before accepting to install it.
 - ii. The use of a secure boot process, based on the use of signed firmware, ensures that the product can boot only with authorized firmware.
 - iii. The use of trusted platform module (TPM) provides a set of cryptographic features suitable for protecting private keys from unauthorized access.
 - iv. TPM is certified according to FIPS 140-2 level 2.
 - d) Authentication
 - i. IEEE 802.1X authentication.
 - ii. Restrict access to pre-defined IP addresses, commonly known as IP address filtering.
 - e) Brute force delay protection
 - 2) Long-Term Supported (LTS) firmware
 - a) The manufacturer must provide LTS firmware that only contains corrections for critical bugs, security flaws and performance issues.
 - b) The device should maintain cybersecurity without introducing any significant functional changes or affecting any existing integrations.
- j. System integration
 - 1) The camera shall be fully supported by an open and published API (Application Programmers Interface), which shall provide necessary information for integration of functionality into third-party applications.
 - 2) The camera shall conform to ONVIF profile G as defined by the ONVIF Organization.
 - 3) The camera shall conform to ONVIF profile S as defined by the ONVIF Organization.
 - 4) The camera shall conform to ONVIF profile T as defined by the ONVIF Organization.
 - 5) The camera shall conform to ONVIF profile M as defined by the ONVIF Organization.
- k. Analytics
 - 1) The camera shall provide a platform allowing the upload of third-party applications into the camera.
 - 2) The camera shall be supplied with preinstalled advanced video analytics capabilities, capable of detecting and classifying humans and vehicles in non-critical indoor and outdoor spaces.

- I. Installation and maintenance
 - 1) The product shall be supplied with Windows-based management software which allows the assignment of IP addresses, upgrade of firmware and backup of the products' configuration.
 - 2) The product shall support the use of SNMP-based management tools according to SNMP v1, 2c & 3 / MIB-II.
 - 3) The product shall allow updates of the software (firmware) over the network, using FTP or HTTP.
 - 4) The product shall provide the ability to apply a rectangle of customer-defined number of pixels to the image, which can be used as a pixel counter identifying the size of objects in number of pixels.
 - 5) The product shall accept external time synchronization from an NTP (Network Time Protocol) server.
 - 6) The product shall store all customer-specific settings in a non-volatile memory that shall not be lost during power cuts or soft reset.
- m. Access log
 - 1) The product shall provide a log file, containing information about the 250 latest connections and access attempts since the unit's latest restart. The file shall include information about the connecting IP addresses and the time of connecting.
 - 2) The product shall provide a connection list of all currently connected viewers. The file shall include information about connecting IP address, time of connecting and the type of stream accessed.
- n. Camera diagnostics
 - 1) The product shall be equipped with LEDs, capable of providing visible status information. LEDs shall indicate the product's operational status and provide information about power, communication with receiver, the network status, and the product status.
 - 2) The product shall be monitored by a Watchdog functionality, which shall automatically re-initiate processes or restart the unit if a malfunction is detected.
 - 3) The product shall send a notification when the unit has rebooted, and all services are initialized.
- o. Hardware interfaces
 - 1) Network interface
 - a) The product shall be equipped with at least one 10BASE-T/100BASE-TX Ethernet-port using a RJ45 connector and shall support auto negotiation of network speed (100 MBit/s and 10 MBit/s) and transfer mode (full and half duplex).
- p. Enclosure
 - 1) The product shall:
 - a) Be manufactured with an IP66/67-, NEMA250 4X- and IK10-rated aluminum enclosure.
 - b) Be fitted with a fixed sunshield.
- q. Power
 - 1) The product shall be connected to a separate midspan and obtain power through a network cable. The midspan shall use 100-240 V AC/50-60 Hz, max 66.1 W, and provide the product with a maximum of:
 - a) 51 W when using a 60 W midspan
- r. Environmental
 - 1) The product shall:

- a) Operate in a temperature range of -20 °C to 50 °C (-4 °F to 122 °F) (with 30 W)
- b) Operate in a temperature range of -50 °C to 50 °C (-58 °F to 122 °F) (with 60 W)
- c) Operate in a maximum temperature (intermittent) of 74 °C (165 F)
- d) Be able to start-up as low as -40 °C (-40 °F) (arctic temperature control)
- e) Operate in a humidity range of 10–100% RH (condensing).

B. Mount Options

1. Wall Mount AXIS T91G61 or an approved equal

C. Acceptable Manufacturer:

2. AXIS Q6075-E or an approved equal

2.4 FIXED MULTI-SENSOR ENVIRONMENTAL IP DOME CAMERA – 4 SENSOR 360

A. The panoramic network camera shall meet or exceed the following design specifications:

1. The camera shall operate on an open source and Linux-based platform and include a built-in web server.
2. The camera shall be equipped with four progressive scan megapixel sensors.
3. The camera shall provide a removable IR-cut filter, providing day/night functionality.
4. The camera shall provide flexible positioning of four varifocal camera heads.
5. The camera shall provide the following field of view:
6. 4x 1440p
 - a. Horizontal: 101° - 49°
 - b. Vertical: 54° - 29°
 - c. Diagonal: 116°–58°
7. The camera shall provide motorized focus and zoom functionality.
8. The camera shall provide local video storage utilizing a microSD/microSDHC/microSDXC memory card expansion.
9. The camera shall be manufactured with an IP66-, NEMA 4X- and IK09-rated Die-casted aluminum casing.
10. The camera shall provide:
 - a. Pan ± 90°
 - b. Tilt +25 to +95°
 - c. Rotation -5 to 95°
 - d. Twist ± 20°

B. Illumination

1. The camera shall meet or exceed the following illumination specifications:
 - a. Color: 0.20 lux at 50 IRE F1.8
 - b. B/W: 0.04 lux at 50 IRE F1.8 lux with IR illumination on

C. Resolution

1. The camera shall be designed to provide 4x video streams in HDTV 1440p (2560x1440) at up to 30 frames per second (60Hz mode) or 25 frames per second (50Hz mode) using H.264, H265 or Motion JPEG.
2. The camera shall support video resolutions including:
 - a. 2560x1440 (QuadHD, 16:9)
 - b. 1920x1080 (HDTV 1080 p)
 - c. 1280x720 (HDTV 720p)
3. The camera shall provide both landscape format (4:3 and 16:9 aspect ratio) as well as corridor format (3:4 and 9:16 aspect ratio).

D. Encoding

1. The camera shall provide independently configured simultaneous H.264 and Motion JPEG streams.
2. The camera shall provide configurable compression levels.
3. The camera shall support standard baseline profile with motion estimation.
4. The camera shall support motion estimation in H.264/MPEG-4 Part 10/AVC.
5. The camera shall support the following video encoding algorithms:
6. Motion JPEG encoding in a selectable range from 1 up to 25/30 frames per second.
7. Baseline Profile H.264 and H.265 encoding with motion estimation in up to 25/30 frames per second.
8. Main Profile H.264 and H.265 encoding with motion estimation and context-adaptive binary arithmetic coding (CABAC) in up to 25/30 frames per second.
9. High Profile H.264 and H.265 encoding with motion estimation up to 25/30 frames per second.
10. The camera shall in H.264 and H.265 support combining Average Bit Rate (ABR) and Maximum Bit Rate (MBR)
11. The camera shall be able to deliver predictable storage using Average Bit Rate (ABR) bitrate controlling algorithm based on a bitrate budget and selected retention time.
 - a. The camera shall be able to deliver predictable storage using Average Bit Rate (ABR) bitrate controlling algorithm based on a bitrate budget and the selected retention time.
 - 1) The ABR bitrate algorithm, depending on the bitrate budget and the selected retention time, shall adjust the bitrate to meet the bitrate budget over the whole retention time.
 - 2) The ABR algorithm shall have a method to keep the video quality even during busy periods by allowing the current bitrate to be significantly above the configured average bitrate during significant parts of the retention time.
 - b. The camera shall in H.264 and H.265 support flexible retention period for Average Bit Rate (ABR) algorithm up to 1 year.
 - c. When using Average Bit Rate (ABR) the camera shall keep bitrate history up to at least 30 days.
 - d. The camera shall in H.264 and H.265 support reuse of past Average Bit Rate (ABR) history if a stream is disconnected and the camera reconnects with the same basic stream parameters.
 - e. When using Average Bit Rate (ABR), the camera shall in H.264 and H.265 support multiple parallel streams with independent ABR-history.
 - f. The camera shall issue bitrate degradation events when using Average Bit Rate (ABR) if the configuration is predicted to be
 - 1) unrealistic
 - 2) not fulfilling basic quality requirements

3) not fulfilling the bitrate budget

E. Transmission

1. The camera shall allow for video to be transported over:
 - a. HTTP (Unicast)
 - b. HTTPS (Unicast)
 - c. RTP (Unicast & Multicast)
 - d. RTP over RTSP (Unicast)
 - e. RTP over RTSP over HTTP (Unicast)
2. The camera shall support Quality of Service (QoS) to be able to prioritize traffic.

F. Image

1. The camera shall incorporate automatic and manual white balance.
2. The camera shall incorporate an electronic shutter operating in the range of 1/66500s to 1/5s.
3. The camera shall incorporate capture mode with the following settings:
4. HDTV 1440p 25/30 fps
5. The camera shall support wide dynamic range functionality at 110dB.
6. The camera shall support manually defined values for:
 - a. Saturation
 - b. Brightness
 - c. Sharpness
 - d. Contrast
7. The camera shall incorporate a function for optimization of low light behavior.
8. The camera shall allow for rotation of the image in steps of 90°.

G. IR illumination

1. The camera shall be equipped with built-in IR LEDs, with a range of up to 15 m (50 ft) with a wavelength of 850 nm.

H. User interface

1. Web server
 - a. The camera shall contain a built-in web server making video and configuration available to multiple clients in a standard operating system and browser environment using HTTP, without the need for additional software.
 - b. Optional components downloaded from the camera for specific tasks shall be signed by an organization providing digital trust services.
2. IP addresses
 - a. The camera shall support both fixed IP addresses and dynamically assigned IP addresses provided by a Dynamic Host Control Protocol (DHCP) server.
 - b. The camera shall allow for automatic detection of the camera based on UPnP and Bonjour when using a computer with an operating system supporting this feature.
 - c. The camera shall provide support for both IPv4 and IPv6.
 - d. The camera shall provide support for IPv6 USGv6.

I. Event functionality

1. The camera shall be equipped with an integrated event functionality:
 - a. Device status
 - 1) IP address
2. Response to triggers shall include event actions:
 - a. Record video: micro SD card and network share
 - b. Upload of images and video clips: FTP, SFTP, HTTP, HTTPS, email, or network share
 - c. Send notification: email, HTTP, HTTPS, TCP, and SNMP trap
 - d. Overlay text
 - e. Day and night mode

J. Storage

1. The camera shall support continuous and event-controlled recording to:
 - a. Local memory added to the cameras microSD-card slot
 - b. Network attached storage, located on the local network
2. The camera shall incorporate encryption functionality for the SD card (AES-XTS-Plain64 256bit).
3. The camera shall be able to detect and notify edge storage disruptions.

K. Protocol

1. The camera shall incorporate support for at least IPv4, IPv6, USGv6, ICMPv4/ICMPv6, HTTP, HTTPS, HTTP/2, SSL/TLS, QoS Layer 3 DiffServ, FTP, SFTP, CIFS/SMB, SMTP, mDNS (Bonjour), UPnP®, SNMP v1/v2c/v3 (MIB-II), DNS/DNSv6, DDNS, NTP, RTSP, RTP, SRTP, TCP, UDP, IGMPv1/v2/v3, RTCP, DHCPv4/v6, SOCKS, SSH, LLDP, CDP, MQTT v3.1.1, Syslog, Link-Local address (ZeroConf).
2. The SMTP implementation shall include support for SMTP authentication.

L. Text overlay

1. The camera shall:
 - a. Provide embedded on-screen text with support for date & time, and a customer-specific text, camera name, of at least 45 ASCII characters.
 - b. Provide the possibility to choose different font sizes for embedded on-screen text, and to use white or black text on at least four different backgrounds.
 - c. Provide the ability to manually set up and configure privacy masks to the image.
 - d. Allow for the overlay of a graphical image, such as a logotype, into the image.

M. Security

1. The camera shall support the following:
 - a. Secure web browsing

- 1) The use of HTTPS and SSL/TLS, providing the ability to upload signed certificates to encrypt and secure authentication and communication of both administration data and video streams.
- 2) Restrict access to the built-in web server by usernames and passwords at three different levels.
- b. Certificate management
 - 3) Provide centralized certificate management, with both pre-installed CA certificates and the ability to upload additional CA certificates. The certificates shall be signed by an organization providing digital trust services.
- c. Enhanced security features
 - 4) The use of signed firmware validates the firmware's integrity before accepting to install it.
- d. Authentication
 - 5) IEEE 802.1x (EAP-TLS) authentication.
 - 6) Restrict access to pre-defined IP addresses, commonly known as IP address filtering.
- e. Brute force delay protection
2. Firmware support
 - f. The manufacturer must provide firmware with long-term support that only contains corrections for critical bugs, security flaws and performance issues.
 - g. The device should maintain high-level cybersecurity without introducing any significant functional changes or affecting any existing integrations.
- N. API support
 1. The camera shall be fully supported by an open and published API (Application Programmers Interface), which shall provide necessary information for integration of functionality into third-party applications.
 2. The camera shall conform to ONVIF profile G as defined by the ONVIF Organization.
 3. The camera shall conform to ONVIF profile S as defined by the ONVIF Organization.
- O. Embedded applications
 1. The camera shall provide a platform allowing the upload of third-party applications into the camera.
- P. Installation and maintenance
 1. The camera shall be supplied with Windows-based management software which allows the assignment of IP addresses, upgrade of firmware and backup of the cameras' configuration.
 2. The camera shall support the use of SNMP-based management tools according to SNMP v1, 2c & 3 / MIB-II.

3. The camera shall allow updates of the software (firmware) over the network, using FTP or HTTP.
4. The camera shall provide the ability to apply a rectangle of customer-defined number of pixels to the image, which can be used as a pixel counter identifying the size of objects in number of pixels.
5. The camera shall accept external time synchronization from an NTP (Network Time Protocol) server.
6. The camera shall store all customer-specific settings in a non-volatile memory that shall not be lost during power cuts or soft reset.
7. The camera shall provide remote zoom and remote focus functionality.

Q. Access log

1. The camera shall provide a log file, containing information about the 250 latest connections and access attempts since the unit's latest restart. The file shall include information about the connecting IP addresses and the time of connecting.
2. The camera shall provide a connection list of all currently connected viewers. The file shall include information about connecting IP address, time of connecting and the type of stream accessed.

R. Camera diagnostics

1. The camera shall be equipped with LEDs, capable of providing visible status information. LEDs shall indicate the camera's operational status and provide information about power, communication with receiver, the network status, and the camera status.
2. The camera shall be monitored by a Watchdog functionality, which shall automatically re-initiate processes or restart the unit if a malfunction is detected.
3. The camera shall send a notification when the unit has rebooted, and all services are initialized.

S. Hardware interfaces

1. Network interface
 - a. The camera shall be equipped with a shielded 10BASE-T/100BASE-TX/1000BASE-T Ethernet-port using a RJ45 connector and shall support auto negotiation of network speed and transfer mode (full and half duplex).

T. Enclosure

1. The camera shall:
 - a. Be manufactured with an IP66-, IP67-, NEMA 4X-rated, IK09 impact-resistant, aluminum, and plastic casing.
 - b. Be fitted with a polycarbonate hard-coated dome with a (PC/ASA) sunshield.

U. Power

1. The camera shall provide Power over Ethernet (PoE) IEEE 802.3at Type 2 Class 4
 - a. With IR illumination on:

- 1) Max: 25.5 W
- 2) Typical: 16.3 W
- b. With IR illumination off:
 - 1) Max: 25.5 W
 - 2) Typical: 10.7 W

V. Environmental

- 1. The camera shall:
 - a. Operate in a temperature range of -30 °C to 50 °C (-22 °F to 112 °F)
 - b. Operate in a humidity range of 10-100% RH (condensing)

W. Mount Options

- 1. Wall Mount AXIS T91G61 or an approved equal
- 2. Corner Mount AXIS T91A64 or an approved equal
- 3. Break Away Pendent Mount AXIS T91B51 or an approved equal

X. Acceptable Manufacturer:

- 1. AXIS P3719-PLE or an approved equal

2.5 FIXED IP DOME CAMERA

A. Minimum Performance Capabilities:

- 1. The specified product shall meet or exceed the following design specifications:
 - a. The camera shall operate on an open source and Linux-based platform and include a built-in web server.
 - b. The camera shall provide a removable IR-cut filter, providing day/night functionality.
 - c. The camera shall be equipped with a varifocal 4.3–8.6 mm, IR-corrected megapixel with P-Iris lens with a 4 MP image sensor.
 - d. The camera shall provide a horizontal field of view between 103° and 53° and a vertical field of view between 56° and 30°.
 - e. The camera shall provide local video storage utilizing a microSD/microSDHC/microSDXC memory card expansion.
 - f. The camera shall be manufactured with a repaintable metal casing.
 - g. The camera shall be manufactured with an IP66-, IP67-, IP6K9K-, NEMA 4X- and IK10+-rated casing with a polycarbonate hard coated dome.
 - h. The camera shall provide a manual 3-axis (pan/tilt/rotation) positioning to allow adjustment for optimum camera rotation and placement.
 - i. The camera shall provide options for clear and smoked lower dome.
- 2. The specified product shall meet or exceed the following performance specifications:
 - a. Illumination
 - 1) The camera shall meet or exceed the following illumination specifications:

- a) Color: 0.06 lux at 50 IRE, F1.5
 - b) B/W: 0 lux at 50 IRE, F1.5
- b. Resolution
 - 1) The camera shall be designed to provide video streams in HDTV 1080p (1920x1080) at up to 60 frames per second (60Hz mode) or 50 frames per second (50Hz mode) using H.264, H265 or Motion JPEG.
 - 2) The camera shall provide 8 individually cropped out view areas.
 - 3) The camera shall support video resolutions including:
 - a) 2688x1512 (4 MP)
 - b) 1920x1080 (HDTV 1080p)
 - c) 1280x720 (HDTV 720p)
 - 4) The camera shall provide landscape format as well as the possibility to adjust the image to stream in corridor format.
- c. Encoding
 - 1) The camera shall provide independently configured simultaneous H.264 and Motion JPEG streams.
 - 2) The camera shall provide configurable compression levels.
 - 3) The camera shall provide a video streaming indicator.
 - 4) The camera shall support standard baseline profile with motion estimation.
 - 5) The camera shall support motion estimation in H.264/MPEG-4 Part 10/AVC.
 - 6) The camera shall support motion estimation in H.265 (MPEG-H Part 2/HEVC).
 - 7) The camera shall support the following video encoding algorithms:
 - a) Motion JPEG encoding in a selectable range from 1 up to 50/60 frames per second.
 - b) Baseline Profile H.264 encoding with motion estimation in up to 50/60 frames per second.
 - c) Main Profile H.264 and H.265 encoding with motion estimation and context-adaptive binary arithmetic coding (CABAC) in up to 50/60 frames per second.
 - d) High Profile H.264 encoding with motion estimation up to 50/60 frames per second.
 - 8) The camera shall in H.264 and H.265 support Variable Bit Rate (VBR), Average Bit Rate (ABR) and Maximum Bit Rate (MBR).
 - 9) The camera shall be able to deliver predictable storage using Average Bit Rate (ABR) bitrate controlling algorithm based on a bitrate budget and selected retention time.
 - a) The camera shall be able to deliver predictable storage using Average Bit Rate (ABR) bitrate controlling algorithm based on a bitrate budget and the selected retention time.
 - i. The ABR bitrate algorithm, depending on the bitrate budget and the selected retention time, shall adjust the bitrate to meet the bitrate budget over the whole retention time.
 - ii. The ABR algorithm shall have a method to keep the video quality even during busy periods by allowing the current bitrate to be significantly above the configured average bitrate during significant parts of the retention time.
 - b) The camera shall in H.264 and H.265 support flexible retention period for Average Bit Rate (ABR) algorithm up to 1 year.
 - c) When using Average Bit Rate (ABR) the camera shall keep bitrate history up to at least 30 days.

- d) The camera shall in H.264 and H.265 support reuse of past Average Bit Rate (ABR) history if a stream is disconnected and the camera reconnects with the same basic stream parameters.
 - e) When using Average Bit Rate (ABR), the camera shall in H.264 and H.265 support multiple parallel streams with independent ABR-history.
 - f) The camera shall issue bitrate degradation events when using Average Bit Rate (ABR) if the configuration is predicted to be
 - i. unrealistic
 - ii. not fulfilling basic quality requirements
 - iii. not fulfilling the bitrate budget.
- 10) The camera shall support scene adaptive bitrate control with one of the following capabilities to lower bandwidth and storage:
- a) Automatic dynamic Region of Interest to reduce bitrate in unprioritized regions to lowering bandwidth and storage requirements.
 - b) Automatic dynamic Group of Pictures to lower bandwidth and storage requirements
 - c) Automatic dynamic Frames per Second to lower bandwidth and storage requirements
- d. Transmission
- 1) The camera shall allow for video to be transported over:
 - a) HTTP (Unicast)
 - b) HTTPS (Unicast)
 - c) RTP (Unicast & Multicast)
 - d) RTP over RTSP (Unicast)
 - e) RTP over RTSP over HTTP (Unicast)
 - f) SRTP (Unicast & Multicast)
 - 2) The camera shall support Quality of Service (QoS) to be able to prioritize traffic.
- e. Image
- 1) The camera shall incorporate automatic and manual white balance.
 - 2) The camera shall incorporate an electronic shutter operating in the range of 1/91000 s to 1 s.
 - 3) The camera shall incorporate capture mode with the following settings:
 - a) HDTV 1080p (1920x1080) with WDR: 25/30 fps (50/60 Hz)
 - b) HDTV 1080p (1920x1080) without WDR: Up to 50/60 fps (50/60 Hz)
 - 4) The camera shall incorporate wide dynamic range – forensic WDR functionality.
 - 5) The camera shall incorporate forensic wide dynamic range functionality providing up to 120 dB dynamic range.
 - 6) The camera shall support manually defined values for:
 - a) Saturation
 - b) Brightness
 - c) Sharpness
 - d) Contrast
 - 7) The camera shall support multiple scene profiles for:
 - a) forensic
 - b) vivid
 - c) traffic overview
 - d) backlit entrance
 - 8) The camera shall incorporate a function for optimization of low-light behavior at different light levels.

- 9) The camera shall incorporate a function to manually correct barrel distortion, by using a slider to correct distortion in the image.
- 10) The camera shall incorporate a function for motion-adaptive exposure to reduce motion blur from approaching or nearby object.
- 11) The camera shall allow for rotation of the image in steps of 90°.
- 12) The camera shall incorporate a function for Electronic Image Stabilization (EIS) for real-time image stabilization.
- 13) The camera shall incorporate automatic defog functionality.
- f. Audio
 - 1) The camera shall support two-way full duplex audio:
 - a) Input sources
 - i. External microphone (balanced/unbalanced)
 - ii. External line device
 - iii. Digital audio input
 - iv. Automatic gain control
 - b) Output sources
 - i. External line device
 - ii. Network speaker pairing
 - c) Microphone power
 - i. Microphone power 5 V on tip
 - ii. Ring power 12 V on ring
 - iii. Phantom power 12 V on tip/ring
 - 2) Encoding
 - a) The camera shall support:
 - i. 24bit LPCM
 - ii. AAC-LC 8/16/48 kHz
 - iii. G.711 PCM 8 kHz
 - iv. G.726 ADPCM 8 kHz
 - v. Opus 8/16/48 kHz
 - vi. Configurable bit rate
- g. IR Illumination
 - 1) The camera shall be equipped with built-in IR LEDs, with a range of up to 40 m (130 ft) and a wavelength of 850 nm.
 - 2) The camera shall be equipped with built-in IR LEDs with automatic seamless adapting angle of illumination and intensity.
- h. User Interface
 - 1) Web server
 - a) The camera shall contain a built-in web server making video and configuration available to multiple clients in a standard operating system and browser environment using HTTP, without the need for additional software.
 - b) Optional components downloaded from the camera for specific tasks shall be signed by an organization providing digital trust services.
- i. IP addresses
 - 1) The camera shall support both fixed IP addresses and dynamically assigned IP addresses provided by a Dynamic Host Control Protocol (DHCP) server.
 - 2) The camera shall allow for automatic detection of the camera based on UPnP and Bonjour when using a computer with an operating system supporting this feature.
 - 3) The camera shall provide support for both IPv4 and IPv6.

- 4) The camera shall provide support for IPv6 USGv6.
- j. PTZ functionality
 - 1) The camera shall:
 - a) Provide digital PTZ functionality.
 - b) Provide preset positions functionality.
 - c) Provide On-screen directional indicator (OSDI) functionality.
 - d) Provide optical zoom functionality: Optical zoom: 2x
 - 2) Provide a guard tour functionality which allows the dome to automatically move between selected presets using an individual speed and viewing time for each preset.
- k. Event conditions
 - 1) The camera shall be equipped with an integrated event functionality:
 - a) Analytics
 - b) External input
 - c) Supervised external input
 - d) Edge storage events
 - e) Virtual inputs through API
 - f) Audio
 - i. Audio detection
 - ii. Audio clip playing
 - g) Call
 - i. State
 - ii. State change
 - h) Device status
 - i. Operating temperature failure
 - ii. Fan
 - iii. IP address
 - iv. Network lost
 - v. Shock detection
 - vi. Casing open
 - vii. Storage failure
 - viii. System ready
 - i) Digital audio
 - i. Digital signal
 - j) Edge storage
 - i. Recording ongoing
 - ii. Storage disruption
 - iii. Storage health
 - k) I/O
 - i. Digital input
 - ii. Manual trigger
 - iii. Virtual inputs
 - l) MQTT
 - i. Subscribe
 - ii. Stateless
 - iii. Scheduled and recurring
 - m) Video
 - i. Tampering
 - ii. Average bitrate degradation
 - iii. Day-night mode

- iv. Live stream open
- 2) Response to triggers shall include event actions:
 - a) I/O: Toggle I/O once or toggle I/O while rule is active
 - b) Record video: SD card and network share
 - c) Upload of images and video clips: FTP, SFTP, HTTP, HTTPS, email or network share
 - d) Send notification: email, HTTP, HTTPS, TCP and SNMP trap
 - e) Pre- and post-alarm video or image buffering for recording or upload
 - f) Calls: end SIP call, make SIP call, answer call
 - g) MQTT publish
 - h) Overlay text
 - i) External output activation
 - j) Play audio clip
 - k) Zoom preset
 - l) Day and night mode
 - m) Make call
 - n) Flash status LED
 - o) Use lights
 - p) Set defog mode
 - q) Send MQTT publish message
 - r) Set WDR mode
- 3) The camera shall provide memory for pre- and post-alarm recordings
- l. Storage
 - 1) The camera shall support continuous, and event controlled recording to:
 - a) Local memory added to the cameras microSD-card slot
 - b) Network attached storage, located on the local network
 - 2) The camera shall incorporate encryption functionality for the SD card (AES-XTS-Plain64 256bit).
 - 3) The camera shall incorporate encryption functionality for the SD card.
 - 4) The camera shall be able to detect and notify edge storage disruptions.
- m. Protocol
 - 1) The camera shall incorporate support for at least IPv4, IPv6, USGv6, ICMPv4/ICMPv6, HTTP, HTTPS, HTTP/2, TLS, QoS Layer 3 DiffServ, FTP, SFTP, CIFS/SMB, SMTP, mDNS (Bonjour), UPnP®, SNMP v1/v2c/v3 (MIB-II), DNS/DNSv6, DDNS, NTP, RTSP, RTCP, RTP, SRTP, TCP, UDP, IGMPv1/v2/v3, DHCPv4/v6, ARP, SOCKS, SSH, SIP, LLDP, CDP, MQTT v3.1.1, Syslog, Link-Local address (ZeroConf).
 - 2) The SMTP implementation shall include support for SMTP authentication.
- n. Text overlay
 - 1) The camera shall:
 - a) Provide embedded on-screen text with support for date & time, and a customer-specific text, camera name, of at least 45 ASCII characters.
 - b) Provide the possibility to choose different font sizes for embedded on-screen text, and to use white or black text on at least four different backgrounds.
 - c) Provide the ability to manually set up and configure privacy masks to the image.
 - d) Allow for the overlay of a graphical image, such as a logotype, into the image.
- o. Security
 - 1) The camera shall support the following:

- a) Secure web browsing
 - i. The use of HTTPS and TLS, providing the ability to upload signed certificates to encrypt and secure authentication and communication of both administration data and video streams.
 - ii. Restrict access to the built-in web server by usernames and passwords at three different levels.
- b) Certificate management
 - i. Provide centralized certificate management, with both pre-installed CA certificates and the ability to upload additional CA certificates. The certificates shall be signed by an organization providing digital trust services.
- c) Enhanced security features
 - i. The use of signed firmware validates the firmware's integrity before accepting to install it.
 - ii. The use of a secure boot process, based on the use of signed firmware, ensures that the camera can boot only with authorized firmware.
 - iii. The use of trusted platform module (TPM) provides a set of cryptographic features suitable for protecting private keys from unauthorized access.
 - iv. TPM is certified according to FIPS 140-2 level 2.
 - v. The use of a cryptographically verifiable hardware module where a collection of certificates, required to verify device identification, is installed.
- d) Authentication
 - i. IEEE 802.1x (EAP-TLS) authentication.
 - ii. Restrict access to pre-defined IP addresses, commonly known as IP address filtering.
- e) Brute force delay protection
- p. System integration
 - 1) The camera shall be fully supported by an open and published API (Application Programmers Interface), which shall provide necessary information for integration of functionality into third-party applications.
 - 2) The camera shall conform to ONVIF profile G as defined by the ONVIF Organization.
 - 3) The camera shall conform to ONVIF profile M as defined by the ONVIF Organization.
 - 4) The camera shall conform to ONVIF profile S as defined by the ONVIF Organization.
 - 5) The camera shall conform to ONVIF profile T as defined by the ONVIF Organization.
- q. Analytics
 - 1) The camera shall provide a platform allowing the upload of third-party applications into the camera.
 - 2) The camera shall be equipped with a built-in, deep-learning processing unit capable of executing neural network algorithms, such as object detection, classification, and segmentation. The deep-learning processing unit shall contain multiple parallel hardware accelerated compute resources capable of performing real-time video inference. The camera manufacturer shall support approved third-party developers to enable custom made deep-learning

- applications using the DLPU to accelerate custom trained deep-learning networks with commonly available network architectures.
- 3) The camera shall be supplied with preinstalled advanced video analytics capabilities, capable of detecting and classifying humans and vehicles in non-critical indoor and outdoor spaces.
- r. Installation and maintenance
- 1) The camera shall be supplied with Windows-based management software which allows the assignment of IP addresses, upgrade of firmware and backup of the cameras' configuration.
 - 2) The camera shall support the use of SNMP-based management tools according to SNMP v1, 2c & 3 / MIB-II.
 - 3) The camera shall allow updates of the software (firmware) over the network, using FTP or HTTP.
 - 4) The camera shall store all customer-specific settings in a non-volatile memory that shall not be lost during power cuts or soft reset.
 - 5) The camera shall provide the ability to apply a rectangle of customer-defined number of pixels to the image, which can be used as a pixel counter identifying the size of objects in number of pixels.
 - 6) The camera shall accept external time synchronization from an NTP (Network Time Protocol) server.
 - 7) The camera shall provide remote zoom and remote focus functionality.
- s. Access log
- 1) The camera shall provide a log file, containing information about the 250 latest connections and access attempts since the unit's latest restart. The file shall include information about the connecting IP addresses and the time of connecting.
 - 2) The camera shall provide a connection list of all currently connected viewers. The file shall include information about connecting IP address, time of connecting and the type of stream accessed.
- t. Camera diagnostics
- 1) The camera shall be equipped with LEDs, capable of providing visible status information. LEDs shall indicate the camera's operational status and provide information about power, communication with receiver, the network status, and the camera status.
 - 2) The camera shall be monitored by a Watchdog functionality, which shall automatically re-initiate processes or restart the unit if a malfunction is detected.
 - 3) The camera shall send a notification when the unit has rebooted, and all services are initialized.
- u. Hardware interfaces
- 1) Network interface
 - a) The camera shall be equipped with one 10BASE-T/100BASE-TX/1000BASE-T Ethernet-port using a RJ45 connector and shall support auto negotiation of network speed and transfer mode (full and half duplex).
 - 2) Inputs/Outputs
 - a) The camera shall be equipped with two configurable I/O ports, accessible via a removable terminal block. These inputs/outputs shall be configurable to respond to normally open (NO) or normally closed (NC) dry contacts. The output shall be able to provide 12 V DC, 50 mA.
 - 3) Audio

- a) The camera shall be equipped with one 3.5 mm jack for line/mic input and one 3.5 mm jack for line output.
- 4) Power
 - a) The camera shall be equipped with a removable terminal block providing connectivity for external power.

v. Enclosure

- 1) The camera shall:
 - a) Be manufactured with an IP66-, IP67-, IP6K9K-, NEMA 4X- and IK10+-rated casing and a polycarbonate hard coated dome.
 - b) Be fitted with a fixed weather shield.

w. Power

- 1) The camera shall provide power over Ethernet IEEE 802.3af/802.3at Type 2 Class 4
 - a) Max: 23 W
 - b) Typical: 9 W
- 2) 10 - 28 V DC
 - a) Max: 24 W
 - b) Typical: 9 W

x. Environmental

- 1) The camera shall:
 - a) Operate in a temperature range of -50 °C to 60 °C (-58 °F to 140 °F)
 - b) Operate in a humidity range of 10–100% RH (condensing).

B. Mount Options

- 1. Wall Mount AXIS T91G61 or an approved equal
- 2. Recessed Mount AXIS T94M02L or an approved equal

C. Acceptable Manufacturer:

- 1. AXIS Q3536-LVE or an approved equal

2.6 POE INJECTOR (Elevator Cameras)

- A. Converts conventional Ethernet to a signal that can be carried by a coaxial cable or Elevator twisted pair traveler.
- B. Shall operate in pairs. Both HIGHWIRES require to be connected to a common ground. An inline isolator shall be required where there is a different ground voltage potential at either end of the cable.
- C. The encoder shall:
 - 2. Shall have an ethernet RJ45 connector.
 - 3. Shall support a standard Ethernet cable: patch or crossover CAT5/CAT6.
 - 4. Shall support 100BaseT/10BaseT full or half duplex.
 - 5. Shall support auto negotiation of the transmission rate.
 - 6. Shall have an RJ45 network connector. It shall support straight through or cross over auto detected cables. The data rates supported will be 100BaseT/10BaseT, full/half duplex with auto negotiation.

7. Shall store incoming Ethernet packets in a memory buffer before transmission that shall result in a delay of approximately 0 - 50 microseconds.
8. Connection shall appear completely transparent to network devices. This shall allow data packets to pass through the encoder without loss, error, or modification.
9. Shall continually test the coaxial cable and shall use the highest data rate achievable on the cable. When the data rate is reduced, the total capacity in both directions shall be reduced.
10. Shall require a continuous length of coaxial cable with no breaks, junctions, T-pieces, or video signal boosters in the line.
11. Shall require an external IEC Class II isolated power supply.
12. Shall operate within an operating voltage range of 9 to 24VDC.

D. Acceptable Manufacturer: Veracity, Altronix or an approved equal.

PART 3 - EXECUTION

3.1 SUBSTITUTIONS

- A. Provide necessary work as detailed on section 28 00 00

3.2 SITE INSPECTIONS

- A. Continuously verify that the site conditions agree with the Documents and the design package. Submit a report to the Architect documenting changes to the site or conditions that affect the 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. No deficiency shall be corrected without written permission from the Architect.
- B. Specific mounting locations, exact wire and cable runs, and conduit routing have not been specified or delineated on the Documents. Coordinate all aspects of the Work with the Architect.

3.3 COORDINATION

- A. Coordinate with the Architect to ensure that adequate conduit is provided, and that equipment back-boxes are adequate for System installation.
- B. Coordinate with the Architect to ensure that adequate power has been provided and properly located for the security System equipment.
- C. Coordinate locations of all devices with the Architect prior to installation.
- D. Coordinate and verify the location of each piece of rack-mounted equipment with the End-user.
- E. Coordinate all initial database partitioning and setup with the End-user prior to initial programming and cardholder data entry.

- F. Coordinate finishes and colors of all equipment with the Architect. Submit all finish and graphics for all equipment in public areas to the Architect for approval prior to installation.

END OF SECTION

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SECTION 28 26 00 ELECTRONIC PERSONAL PROTECTION SYSTEMS

PART 1 - GENERAL

SCOPE OF WORK

- A. The Work shall include installation and certification of the following:
 - 1. Integrated Security Management System (SMS) consisting of:
 - a. Wireless Duress Alarm System (WDA)
 - b. Wireless Duress Buttons
 - c. Wireless Duress Repeaters
 - 2. Interfaces
 - a. WDA/ACAMS
 - b. WDA/VMS
 - c. WDA/PLC
 - d. WDA/UPS
 - 3. Miscellaneous:
 - a. Wire and cable to install all equipment as specified herein.
 - b. Conduit and back boxes (not shown on the Drawings as provided but required for a complete installation).
 - c. Equipment Racks and Enclosures required to house all equipment as specified herein.

RELATED SECTIONS

- B. Division 01 - General Requirements
- C. 01 91 13 - General Commissioning Requirements
- D. Division 26 - Electrical
- E. Division 27 - Communications
- F. 28 05 00 - Electronic Security Common Work
- G. 28 10 00 - Electronic Access Control and Intrusion Detection
- H. 28 23 00 - Electronic Video Surveillance
- I. 28 46 10 - Detention Monitoring and Control Operational Sequence
- J. 28 46 19 - Detention PLC Electronic Monitoring and Control Systems

ADDITIONAL REQUIREMENTS

- K. Refer to Section 28 05 00 Electronic Security Common Work, for additional Part 1 - General requirements.
- L. Additional support systems integrated with existing wireless duress alarm systems.

PART 2 - PRODUCTS

WIRELESS DURESS ALARM SYSTEM

A. System Overview

1. The Wireless Duress Alarm System shall be a fast-wireless communications system, capable of transmitting unique pinpointed messages without delay to security personnel via security monitoring stations, two-way radios, pagers, phones, and email.
2. The wireless duress system uses public spectrum for alarm input from wireless duress buttons and the local Court radio frequency for the indicating output.
3. A triggered alarm shall be announced on the Court's mobile radios using a recorded message. For example, the message from a courtroom duress button in Courtroom A may say, "Duress alarm in Courtroom A."
4. The duress system shall be connected to the network for transaction log reporting and alarm integration with ACAMS and VMS systems. The duress system shall also be connected to a telephone line for remote system maintenance.
5. The Wireless Duress Alarm System shall consist of a Wireless Base Unit, Wireless Repeaters, associated system power supplies, and Wireless Duress Alarm Buttons.
6. Wireless duress alarm activation shall trigger the alarm event and provide annunciation and graphical alarm display on the security monitoring workstations.
7. The system shall be configured to allow security personnel to move about the premises when needed and respond quickly and effectively to an emergency call.
8. Acceptable Manufacturers
 - a. Response Technologies, Centurion "Elite" series
 - b. No substitution

B. The System shall be capable of the following features:

1. Email alarm history log by Ethernet interface to desktop, cell phone, pager, or other text capable devices.
2. Capable of monitoring 255 locations with one stand-alone base unit.
3. Capable of providing different communication paths to be programmed for each sensor.
4. Allow transmissions to be scheduled to automatically broadcast on differing devices, dependent upon the time of day.
5. Provided with flash memory to allow system expansion and operating system upgrade via integrated modem.

C. Base Unit Technical Specifications

1. System shall be password protected.
2. 16-button keypad and LCD Screen user controls.
3. Message capability: 1 to 255
4. Processes alert message in less than one second
5. FCC Class A&B Digital Device Verification Compliant
6. Capable of integrated Flash Memory Upgrade.
7. Support various sensor types, including duress button, motion detector, smoke detector, glass break detector, door/window contact, temperature detector.
8. Shall continuously monitor active sensors for performance. Monitor and log events including sensor tamper, low battery, and missing events.
9. Continuous signal strength level monitoring.
10. Built-in relays to integrate with external security systems.
11. Input Power: 110VAC
12. Integrated battery back-up, Yuasa or approved equal.

13. Dimensions: 15" L x 12" W x 5.5" D
14. Weight: 17.5 lbs.
15. Acceptable Manufacturers:
 - a. Response Technologies Control Unit
 - b. Approved equal.
16. Provide, install, and configure associated client software on control equipment.
 - a. Acceptable Manufacturers: Centurion EchoStream (ES)
17. Provide and install surge protection device on power circuit serving control equipment.
 - a. Acceptable Manufacturers: Centurion R3101 Surge Protection Device

D. Wireless Repeater Units

1. General
 - a. Provide wireless duress repeaters as indicated on the Drawings to provide necessary wireless coverage for wireless duress alarm devices.
 - b. During system installation and start-up phase, Contractor shall provide additional repeaters as needed to ensure sufficient wireless coverage for proper system operation throughout all affected areas containing fixed point duress alarm transmitters.
 - c. Repeaters shall be mounted indoors below ceilings, unless otherwise indicated on the plans to be above ceiling, wall mount, or exterior mount.
 - d. Shall receive, decode, and retransmit signals from all system alarm transmitters located within the range of the repeater.
 - e. Shall effectively double the range of all associated wireless duress system alarm transmitters.
 - f. Device shall utilize low-voltage power input, contain on board battery back-up, and supervision of battery back-up protection.
2. Technical Specifications
 - a. Weather resistant enclosure
 - b. Radio Frequency: 900 MHz
 - c. Antenna: Internal wire
 - d. Meet FCC limits for spurious emissions.
 - e. Supervision: Signal strength and battery condition
 - f. Input Power: 110VAC
 - g. Integrated battery back-up, Yuasa or approved equal.
 - h. Dimensions: 7" x 7" x 3"
3. Acceptable Manufacturers:
 - a. Response Technologies E4015 Signal Booster
 - b. Approved equal.

E. Wireless Duress Button (Fixed Point Transmitter)

1. Provide wireless duress transmitters as indicated on the Drawings, for under desk and under countertop applications.
2. Fixed point wireless duress buttons shall be permanently affixed below counter tops or in the knee space of desks with screw fasteners, as per Manufacturer's written recommendations. Coordinate final location and special mounting requirements with Owner and Architect.
3. Activation of the wireless duress button shall transmit a wireless duress signal, which shall be received, and re-transmitted by wireless repeaters located within the appropriate transmission range.
4. Wireless duress alarms will be silent at the location.

5. Activation of these alarms shall initiate an alarm event within the WDA primary Control Unit.
 6. Duress alarm activation shall cause audio and visual alarm indication on security monitoring workstations. Visual alarm indication shall include building and floor location, and graphical map indicating specific fixed duress alarm point.
 7. LED shall flash to indicate each transmission.
 8. Technical Specifications:
 - a. Single button activation
 - b. On-board LED
 - c. Supervised signal strength and battery condition
 - d. Radio Frequency: 900 MHz
 - e. Antenna: Internal wire
 - f. Meet FCC limits for spurious emissions.
 - g. Battery Type: 3V Lithium
 - h. Battery Life: 3 to 5 years
 - i. Weight: approximately 2 oz.
 9. Acceptable Manufacturers:
 - a. Response Technologies E4005 Wireless Duress Button
 - b. Approved equal.
- F. Industrial Wireless Duress Button (Fixed Point Transmitter)
1. Provide wall-mount, industrial style (Red Mushroom Button) wireless duress transmitters as indicated on the Drawings, for wall mount applications.
 2. Fixed point industrial wireless duress buttons shall be permanently affixed to walls, in recessed back-box. Coordinate final location and special mounting requirements with Owner and Architect.
 3. Activation of the wireless duress button shall transmit a wireless duress signal, which shall be received, and re-transmitted by wireless repeaters located within the appropriate transmission range.
 4. Wireless duress alarms will be silent at the location.
 5. Activation of these alarms shall initiate an alarm event within the WDA primary Control Unit.
 6. Duress alarm activation shall cause audio and visual alarm indication on security monitoring workstations. Visual alarm indication shall include building and floor location, and graphical map indicating specific fixed duress alarm point.
 7. Technical Specifications:
 - a. Large 1.5" Red Mushroom Button
 - b. Stainless steel wall plate
 - c. Single-gang mount application
 - d. Supervised signal strength and battery condition
 - e. Radio Frequency: 900 MHz
 - f. Antenna: Internal wire
 - g. Meet FCC limits for spurious emissions.
 - h. Battery Type: 3V Lithium
 - i. Battery Life: 4 to 5 years
 - j. Weight: approximately 8 oz.
 8. Acceptable Manufacturers:
 - a. Response Technologies E4018 Wireless Duress Button
 - b. Approved equal.
- G. Wireless Transmitter Unit (Fixed Point) for Intercom Sub-Station Duress Buttons

1. Provide wireless transmitter unit to interface to detention movement area intercom sub-station duress buttons, where indicated on the Drawings.
2. Shall allow detention intercom sub-station duress alarms to be integrated into the wireless duress system, as specified within this section, including automatic audio messaging over Sheriff radios. Provide additional relays and wiring as required to provide the interface and integration. Refer to Section 28 46 35 for additional information on intercom units.
3. Activation of intercom unit duress button shall transmit a wireless duress signal, which shall be received, and re-transmitted by wireless repeaters located within the appropriate transmission range.
4. Wireless duress alarms will be silent at the location.
5. Activation of these alarms shall initiate an alarm event within the WDA primary Control Unit.
6. Duress alarm activation shall cause audio and visual alarm indication on security monitoring workstations. Visual alarm indication shall include building and floor location, and graphical map indicating specific fixed duress alarm point.
7. Technical Specifications:
 - a. Supervised signal strength and battery condition
 - b. Radio Frequency: 900 MHz
 - c. Antenna: Internal wire
 - d. Meet FCC limits for spurious emissions.
 - e. Battery Type: 3V Lithium
 - f. Battery Life: 4 to 5 years
8. Acceptable Manufacturers:
 - a. Response Technologies E4018 Wireless Duress Button
 - b. Approved equal.

H. Wireless Duress Alarm Interface to ACAMS/PLC

1. Interface the Wireless Duress Alarm System within the facility, to the ACAMS system, such that all local wireless duress alarms are annunciated on all ACAMS and Detention Control Security Workstations.
2. Activation of local wireless duress alarms shall initiate an alarm event on ACAMS and Detention Control workstation alarm monitoring application. Duress alarm activation shall cause audio and visual alarm indication. Visual alarm indication shall include building and floor location, and graphical map indicating specific fixed duress alarm point.
3. All duress button alarms, door alarms, and intercom calls shall, through integration to the VMS system, provide automatic call-up of the associated camera nearby, allowing security officers to verify the alarm or intercom call. The video called-up in from the system event shall be displayed on the video system client, not the access control client. However, alarm events must be recorded in both systems. Integration between the security systems may be an Application Programming Interface (API) integration or an American Standard Code for Information Interchange (ASCII) integration.

PART 3 - EXECUTION

REQUIREMENTS

- A. Refer to Specification Section 28 05 00 Electronic Security Common Work, for Part 3 - Execution requirements.

516 N. KINGS ST. WILMINGTON, DE
JULY 3, 2026

NEW CASTLE COUNTY CUSTOM HOUSE RENOVATION
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END OF SECTION 28 26 00

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SECTION 28 52 20

SECURITY COMMUNICATION SYSTEMS

PART 1 - GENERAL

1.1 GENERAL REQUIREMENTS

- A. Applicable requirements of Division 01 - General Requirements and Division 28, Section 28 00 00 shall be considered a part of this section and shall have the same force as if printed herein full.
- B. The work to be done under this section of the Specifications shall include the furnishing of labor, material, equipment, and tools required for the complete installation of the work indicated on the Drawings, as specified herein, or as noted in other sections of Division 28 – Electronic Safety and Security.
- C. All materials, obviously a part of the electronic security infrastructure and necessary to its proper operation, but not specifically mentioned or shown on the Drawings, shall be furnished, and installed without additional charge.
- D. The Drawings and Specifications are complementary to each other and what is called for by one shall be as binding as if called for by both. If a discrepancy exists between the Drawings and Specifications, the higher level of functionality shall be included to meet the design intent.
- E. Work and products provided must conform to the State of Delaware's Building Access Security Standard, SE-ACCESS-001. This standard as authorized by Delaware Law, Title 29, Chapter 90C mandates the use of specific technology and products to establish consistency in both quality and the security as well as interoperability.
- F. The security contractors must be an approved vendor with the Delaware Department of Technologies & Information (DTI) and currently certified on all security related systems. Submittals/work shall be restricted to vendors have met the minimum requirements and are listed as a security vendor by the manufacturers and approved by the Owner or their authorized representative. The work detailed in these specifications and associated drawings are an expansion of the Owner's existing Security Management System (SMS). The products utilized on this project must be fully and completely compatible and supported by the Owner's existing SMS with no exceptions.

1.2 RELATED SECTIONS

- A. 28 00 00 Electronic Safety and Security

1.3 WORK INCLUDED

- A. The work shall consist of turnkey system comprised of these core systems:
 - 1. Access Control System
 - 2. Security Communication Systems
 - 3. Video Surveillance System

4. Wire and cable to install all equipment as specified herein
5. Miscellaneous conduit, power supplies, and back boxes (not shown on the Documents as provided, but required for a complete installation)

1.4 GENERAL SYSTEM DESCRIPTION

- A. The purpose of the Intercom System shall be to provide voice communication capability in "simplex", "duplex" or "full duplex" mode selectable for each subscriber separately. The system shall also provide extensive group call, all call features and pre-programmable conferences and flexible conferences with an unlimited number of subscribers in each conference.
- B. Intercom substations mounted at the secured point of entry shall provide hands-free communication between the unsecured point of entry and the security control center. The system must be capable of routing a call from a door/gate station to any master stations located throughout the site.
- C. All door intercom substations must operate on a single network using shared answering stations and interconnected via the network.
- D. The exterior intercom substations shall be weather and insect resistant when fully assembled and installed.

1.5 QUALIFICATIONS

- A. Manufacturer of system shall have a minimum of three years' experience of successful installation of systems equivalent in function to the system proposed herein.
- B. Shall provide a certified partner program, whereby training and certification programs shall qualify the suitability of the installers.

PART 2 - PRODUCTS

2.1 GENERAL

- A. All products not provided by the end-user shall be new and unused and shall be of manufacturer's current and standard production.
- B. Where two or more equipment items of the same kind are provided, all shall be identical and provided by the same manufacturer.
- C. Drawings and Specifications indicate major system components, and may not show every component, connector, module, or accessory that may be required to support the operation specified. Contractor shall provide all components needed for complete and satisfactory and intended operation.
- D. Intercoms shall be IP-based and comply with established network standards and intercoms shall be powered by the switch utilizing the network cable.

- E. Intercoms shall be fully supported by an open and published API (Application Programmers Interface), which shall provide necessary information for integration of functionality into third party applications.
- F. The specified unit shall be of manufacturer's official product line, designed for commercial and/or industrial 24/7/365 use.
- G. The specified unit shall be based upon standard components and proven technology using open and published protocols.
- H. Product Availability:
 - 1. Contractor, prior to submitting a proposal, shall determine product availability and delivery time, and shall include such considerations into his proposed Contract Time.
 - 2. Certain products specified may only be available through factory authorized dealers and distributors. Contractor shall verify his ability to procure the products specified prior to submitting a proposal.

2.2 DESKTOP COMMUNICATION STATION WITH VIDEO

- A. Description: An IP desktop intercom master station that provides both visual and audible alerts from the door and emergency phone stations. It shall feature a large high contrast LCD with backlight compensation, which allows display information of the system to be shown clearly under various lighting conditions. It shall be provided with direct access keys to provide single-touch access to stations, group calls, audio monitoring, public address zones, and integrated door release. It shall be provided with the following features:
 - 1. Power Requirement: Power over Ethernet
 - 2. Connection Type: RJ45 (Ethernet)
 - 3. IP Protocols: TCP, UDP, RTP, DHCP, Stenofon CCoip
 - 4. Audio Technology: Open duplex with acoustic echo cancellation and handset volume control
 - 5. Audio Output 1.5-watt audio output, 85 dB pressure@ 1 meter from the speaker
- B. Acceptable Manufacturer:
 - 1. 2N Indoor View desktop mounted intercom master station with integrated video, no exceptions.

2.3 INTERCOM DOOR STATION WITH VIDEO

- A. Description: The unit shall be an IP based substation with a unique design that includes a microphone, a call button, LED and electronic preamplifier. The unit shall provide excellent sensitivity and voice quality. It shall provide clear, hands-free, two-way voice communication upon activation.
 - 1. The intercom shall meet or exceed the following design specifications:
 - a. The intercom shall include a built-in web server.
 - b. The intercom shall be of rugged design for tough outdoor environments.

- c. The intercom shall be equipped with a HD camera utilizing an IR-sensitive progressive scan megapixel sensor and be able to provide images also under dark conditions.
 - d. The integrated camera shall provide an automatic IR-cut filter, providing day/night functionality.
 - e. The intercom shall be equipped with built-in power adaptive IR-illumination/LED.
 - f. The intercom shall be equipped with one push button with embedded backlight and replaceable labels for call-up functionality.
 - g. The video output of the intercom shall be seamless integrated to a digital network video recorder for recording of all camera activity.
2. The intercom shall meet or exceed the following performance specifications:
- a. Video
 - 1) The intercom shall provide video streams in 640x480 at up to 30 frames per second using H.264, H.263, H.263+ or up to 15 frames per second using MJPEG.
 - 2) The intercom camera shall provide images in resolutions up to 1280x960.
 - 3) The intercom shall support the following video encoding algorithms:
 - a) H.263+
 - b) H.263
 - c) H.264
 - d) MPEG-4 Part 2
 - e) MJPEG
 - 4) The intercom shall provide independently configured simultaneous H.264 and MJPEG streams.
 - 5) The intercom shall in H.263, H.263, H.264 support Constant Bit Rate (CBR) to protect the network from unexpected bit rate peaks.
 - 6) The intercom shall provide configurable compression levels.
 - 7) Support standard baseline profile H.264 with motion estimation.
 - 8) Support motion estimation in H.264/MPEG-4 Part 10/AVC.
 - 9) The intercom shall allow for video to be transported over:
 - a) HTTP (Unicast)
 - b) HTTPS (Unicast)
 - c) RTP (Unicast & Multicast)
 - d) RTP over RTSP (Unicast)
 - e) RTP over RTSP over HTTP (Unicast)
 - 10) The intercom shall support Quality of Service (QoS) to be able to prioritize traffic.
 - b. Image
 - 1) The camera shall incorporate automatic white balance.
 - 2) The camera shall support manually defined values for:
 - a) Color level
 - b) Brightness
 - c. Audio

- 1) The intercom shall support two-way full duplex audio:
 - a) Input sources
 - 1) Two internal microphones
 - b) Output sources
 - 1) Built-in speaker, 10W
 - 2) Line out
- d. The intercom shall support separately adjustable volume levels for:
 - 1) Call
 - 2) Key
 - 3) Ring tones
 - 4) Preloaded audio clips
 - 5) Warning tones
 - 6) Paging
- e. The intercom shall support adaptive gain control.
- f. Encoding
 - 1) The intercom shall support:
 - a) G.711
 - b) G.722 (wideband)
 - c) G.729
 - d) L16 / 16kHz (wideband)
- g. The intercom shall provide a sound pressure level of at least 94dB at 1kHz at 1m.
- h. The intercom shall be equipped with active echo cancellation.
- i. The intercom shall allow for audio to be transported over:
 - 1) RTP (Unicast & Multicast)
 - 2) RTP over RTSP (Unicast)
 - 3) RTP over RTSP over HTTP (Unicast)
- j. The intercom shall support Quality of Service (QoS) to be able to prioritize traffic.
- k. Call functionality
 - 1) The intercom shall support SIP for integration with VoIP, peer-to-peer or integrated into SIP/PBX.
 - 2) The intercom shall support the use of SIP Proxy, which can be the same as the SIP registrar for outgoing calls.
 - 3) The intercom shall support dialing of up to twelve separate numbers in sequence or as one ring group.
- l. Access control functionality
 - 1) The intercoms' outputs shall support remote control using DTMF codes.

2) Each user shall have unique access codes for each electrical output.

m. User Interface

1) Web server

a) The intercom shall contain a built-in web server making functionality and configuration available to multiple clients in a standard operating system and browser environment using HTTP, without the need for additional software.

n. Language Specification

1) The intercom shall provide a function for altering the language of the user interface and shall include support for at least 7 different languages and include an ability to support an additional language through customization.

o. IP addresses

- 1) The intercom shall support both fixed IP addresses and dynamically assigned IP addresses provided by a Dynamic Host Control Protocol (DHCP) server.
- 2) The intercom shall allow for automatic detection of the intercom based on WS Discovery when using a computer with an operating system supporting this feature.
- 3) The intercom shall provide support IPv4.

p. Event functionality

- 1) The intercom shall be equipped with an integrated event functionality, which can be triggered by:
 - a) Tamper / case open
 - b) SIP Call state incl. incoming call
 - c) Change of SIP registration status
 - d) Noise Detection
 - e) SIP DTMF sequences
 - f) External input
 - g) Button press
 - h) Predefined time
- 2) Response to triggers shall include:
 - a) Send notification, using HTTP or email
 - b) Activate sound alarm
 - c) Make or end call
 - d) Send notification, using HTTP, HTTPS, Wiegand or email
 - e) Activating external output
 - f) Play audio clip

q. Protocol

- 1) The intercom shall incorporate support for at least HTTP, HTTPS, SIP 2.0, TFTP, RTSP, RTP, SMTP, DHCP opt 66, NTP, Syslog.
- 2) The SMTP implementation shall include support for SMTP authentication.
- 3) The intercom shall incorporate support for at least IPv4, HTTP, HTTPS, SIP, SSL/TLS, QoS Layer 3 DiffServ, TCP, ICMP, SNMPv2c, RTSP, RTP, UDP, IGMP, RTCP, SMTP, FTP, DHCP, ARP, DNS, NTP,

r. Security

- 1) The intercom shall support the use of HTTPS and SSL/TLS, providing the ability to upload signed certificates to encrypt and secure authentication and communication of both administration data and audio streams.
- 2) The intercom shall block its login page for 30 seconds after three faulty passwords have been submitted.
- 3) The intercom shall force user to change default admin password upon first installation.
- 4) The intercom shall provide centralized certificate management, with the ability to upload CA certificates. The certificates shall be signed by an organization providing digital trust services.
- 5) The intercom shall support IEEE 802.1X authentication.
- 6) Selected services, such as RTSP or web config shall be configurable to only allow access from local devices.
- 7) The intercom shall restrict access to the built-in web server by username and password.
- 8) The intercom shall be equipped with tamper detection.

s. API support

- 1) The intercom shall be fully supported by an open and published API (Application Programmers Interface), which shall provide necessary information for integration of functionality into third party applications.
- 2) The intercom shall conform to ONVIF profile S as defined by the ONVIF Organization.
- 3) The intercom shall be interoperable/certified with major PBX and gateway manufacturers, including:
 - a) Cisco
 - b) Avaya
 - c) Broadsoft

t. Installation and maintenance

- 1) The intercom shall support secure configuration using HTTPS.
- 2) The intercom shall support the use of SNMP-based management tools according to SNMP v2c.
- 3) The intercom shall allow updates of the software (firmware) over the network, using TFTP, HTTP or web interface.
- 4) The intercom shall accept external time synchronization from an NTP (Network Time Protocol) server.
- 5) The intercom shall support back-up and restore of configuration.

- 6) The intercom shall store all customer-specific settings in a non-volatile memory that shall not be lost during power cuts or soft reset.

u. Access log

- 1) The intercom shall be able to log events such as codes, phone calls, and provide them using HTTP interface for monitoring.
- 2) The administrator shall be able to set whether the particular messages are sent by the intercom immediately after any event occurs, or if the client registers for event logging and then asks for full report since last registration, all events at once.
- 3) The client shall be able to select which messages are reported from event log.

v. Intercom diagnostics

- 1) The intercom shall be equipped with LEDs, capable of providing visible status information. LEDs shall indicate the intercom's operational status and provide information about power, the network status, and the intercom status.
- 2) The intercom shall be monitored by a Watchdog functionality, which shall automatically re-initiate processes or restart the unit if a malfunction is detected.

w. Hardware interfaces

1) Network interface

- a) The intercom shall be equipped with one 10BASE-T/100BASE-TX Fast Ethernet-port, using a standard RJ45 connector and shall support auto negotiation of network speed (100 MBit/s and 10 MBit/s) and transfer mode (full and half duplex).

2) Door Release

- a) The intercom shall be equipped with two independent outputs for door control. One active providing at least 8VDC / 600mA and one NO/NC relay supporting up to 30V AC/DC 1A.

3) Audio

- a) The intercom shall be equipped with line output.

4) Power

- a) The intercom shall be equipped with a terminal block providing connectivity for external power.

5) Enclosure

- a) The intercom shall:
 - 1) Be manufactured with IP69K rated housing, and be IK10
 - 2) Be fitted with a tamper switch.

- 3) Be of ruggedized construction.
- 4) Be available in black surface finish

6) Power

- a) Power over Ethernet IEEE 802.3af/802.3at Type 1 Class 0
- b) 12 V DC

- 1) Max: 2A

7) Environmental

- a) The intercom shall:

- 1) Operate in a temperature range of -40 C to +55 C (-40 F to 131 F)
- 2) Operate in a humidity range of 10–95% RH (non-condensing).

B. The intercom provided must be listed as an existing integration partner with the client's security management system and the device shall be seamlessly integrated to all the associated security management systems.

C. Approved Manufacturer:

- 1. AXIS 2N IP Force intercom substation with integrated video, no exceptions.

2.4 QUALITY ASSURANCE

- A. The Contractor or security sub-contractor shall be a licensed security Contractor with a minimum of five (5) years' experience installing and servicing systems of similar scope and complexity and evidence that is completed at least three (3) projects of similar design and is currently engaged in the installation and maintenance of systems herein described.
- B. All installation, configuration, setup, program, and related work shall be performed by electronic technicians thoroughly trained by the manufacturer in the installation and service of the equipment provided.
- C. The contractor or designated sub-contractor shall submit credentials of completed manufacturer certification, verified by a third-party organization, as proof of the knowledge.
- D. The Contractor shall provide four (4) current references from clients with systems of similar scope and complexity that became operational in the past three (3) years. At least three (3) of the references shall be utilizing the same system components, in a similar configuration as the proposed system
- E. The specified unit shall be manufactured in accordance with ISO 9001.

2.5 WARRANTY

- A. All security system components and labor furnished by the contractor including wiring, software, hardware, and custom parts shall be fully warranted for parts, materials, labor, and travel expenses for a minimum of three (3) years.

- B. The manufacturer shall provide warranty and optional extended warranty for the unit for a total period of maximum five years. If enacted as part of the contract, the contractor will repair or replace parts and/or labor per the warranty for the length of this warranty at no cost to the client.

2.6 DOOR RELEASE

- A. Provide remote release functionality for all door/gates that are associated with a substation intercom.
- B. Provide all necessary power, mounts, box boxes, and adapters as required for a fully functional and operational system that is seamlessly integrated to the site security management system.

PART 3 - EXECUTION

3.1 GENERAL

- A. Provide necessary work as detailed in Section 28 00 00.
 - 1. Install system according to NFPA 70, applicable codes, and manufacturer's recommendations.
 - 2. Provide necessary interconnections, services, and adjustments required for a complete and operable system.
 - 3. Install power, communications, and data transmission line grounding as necessary to preclude ground loops, noise, and surges from adversely affecting system operation.
 - 4. Install equipment to comply with the manufacturer's recommendations.
- B. Identification of Conductors and Cables:
 - 1. Apply wire and cable marking tape to designate wires and cables to identify media in coordination with system wiring diagrams.
- C. Wall-Mount Unit:
 - 1. Coordinate installation with the architect. Provide surface-mount or flush housing as directed by the architect. Provide conduit from housing to interior accessible ceiling space.

3.2 INSTALLATION

- A. Shall be installed by qualified technicians who have been factory trained and certified by the manufacturer.
- B. Wiring shall be uniform and in accordance with national electric codes and manufacturers' instructions.
- C. Equipment shall be firmly secured, plumb, and level.
- D. All splices shall be in easily accessible junction boxes or on terminal boards.

- E. All cable runs at the main terminal board and in all junctions, boxes shall be tagged and identified.
- F. Coordinate all work with other effected trade.
- G. Identification of Conductors and Cables:
 - 1. Apply wire and cable marking tape to designate wires and cables to identify media in coordination with system wiring diagrams.
- H. Wall-Mount Unit:
 - 1. Coordinate installation with the architect. Provide surface-mount or flush housing as directed by the architect. Provide conduit from housing to interior accessible ceiling space.

3.3 SYSTEM STARTUP

- A. Power shall only be applied to the system after re-checking for proper grounding of the system and measuring all loops for lack of shorts, grounds, and open circuits.

3.4 COMMISSIONING

- A. After all Work is completed, and prior to requesting the Acceptance test, conduct a final inspection, and pre-test all equipment and system features. Correct any deficiencies discovered as the result of the inspection and pre-test.
- B. Submit a request for the Acceptance test in writing to the Project Manager, no less than fourteen days prior to the requested test date. The request for Acceptance test shall be accompanied by a certification that all Work is complete and has been pre-tested, and that all corrections have been made.
- C. During Acceptance test, demonstrate all equipment and system features to the inspector. Remove covers, open wiring connections, operate equipment, and perform other reasonable work as requested by the inspector.
- D. Any portions of the Work found to be deficient or not in compliance with the Project Drawing and Specifications will be rejected. The Project Manager will prepare a list of any such deficiencies observed during the Acceptance test. Promptly correct all deficiencies. Upon correction of deficiencies, submit a request in writing to the Project Manager for another Acceptance Test.
- E. If, at the conclusion of the Acceptance Test, all Work is found to be acceptable and in compliance with the Project Drawings and Specifications, the Project Manager will issue a letter of Acceptance to GC.

3.5 INITIAL PROGRAMMING AND CONFIGURATION

- A. System shall include all software necessary for system configuration.

- B. Provide initial programming and configuration of the security communication system. Input of all program data shall be by Security integrator. Consult with Security Consultant and Owner to determine operating parameters.
- C. System shall be turned on and adjustments made to meet requirements of specifications and on-site conditions.
- D. System shall be programmed to function as specified.
- E. Directory numbers, feature codes, and special programming shall be documented, printed, and made available to owner.
- F. Intercom license installed at SMS Server and intercom units programmed in SMS.
- G. Owner shall provide floor plan drawings, in the form of AutoCAD .DWG or .DXF files, as the basis for the creation of maps.
- H. Maintain hard copy worksheets which fully document the system program and configuration. Worksheets shall be kept up to date daily until final Acceptance by Owner. Worksheets shall be subject to inspection and approval by Owner. Provide final copies to Owner prior to Project Close-out.
- I. Maintain a complete, up-to-date backup of the system configuration and cardholder database. Backup shall be maintained throughout programming period until final Acceptance by Owner. Submit back-up files to Owner upon Final Acceptance.

3.6 TRAINING

- A. Provide complete operator training on the Security Communications System including integration to the Security Management System. Training shall consist of eight (8) hours of classroom instruction for people selected by Owner, plus two (2) hours of individual hands-on training for each of four (4) people selected by Owner. Hands-on training shall include the opportunity for each person to operate the system, and to practice each operation that an operator would be expected to perform.
- B. Training shall cover all operating features of the system.
 - 1. Making and responding to call requests
 - 2. Graphical User Interface (GUI) in SMS for making and responding to call requests
 - 3. Other SMS integration features
 - 4. Routine maintenance and adjustment procedures.
- C. Training sessions are to be held at Owner's facility and are to be scheduled at the convenience of Owner. Provide written training outline and agenda for each training session prior to scheduling.
- D. Provide written training materials for each person.

3.7 SOFTWARE ENGINEERING SUPPORT

- A. Provide the services of a software engineer to assist the Owner in coordinating the interfaces between the security management system and the staff databases and a paging system or other remote notification system.
- B. Software engineer shall be employed by the manufacturer of the security management system and shall be thoroughly knowledgeable of the security management system applications.
- C. Software engineer shall be on-site and available to meet with Owner's representatives for a period of not less than two consecutive days. On-site visit shall be scheduled at the convenience of the Owner.

END OF SECTION

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