Smithsonian Institution

Office of Planning, Design & Construction

SPECIFICATIONS

PROJECT NO.: 2233105

PROJECT TITLE: UPGRADE ELECTRONIC SECURITY AT
VET HOSPITAL, QUARANTINE & NECROPSY

FACILITY: National Zoological Conservation Biology Institute (NZCBI)
Washington, DC

DATE: 30 May 2025 - 100% Final Documents

This project is approved as being in conformance with applicable provisions of the Smithsonian Directive (SD) 410.

Michael J. Carrancho, P.E., Deputy Director Date

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(ver 08-09-2024)

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SECTION 01000

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SECTION A - PROJECT SUMMARY AND INFORMATION

1. PROJECT INFORMATION

1.1. Project No. **2233105**
NZP-DC: Vet Hospital ESS Modernization
National Zoological Park
3001 Connecticut Avenue, NW
Washington, D.C. 20008

Smithsonian Institution Contacts:

Contracting Officer (CO), address for Fed Ex and UPS delivery:
Smithsonian Institution
Office of Contracting
600 Maryland Avenue, SW, Suite 500E
Washington, DC 20024

Contracting Officer (CO), address for USPS delivery:
Smithsonian Institution
Office of Contracting
MRC 1200
P.O. Box 37012
Washington, DC 20013-7012

Contracting Officer's Technical Representative (COTR), address for Fed Ex and UPS delivery:
Smithsonian Institution
Attn: Marc Muller, Office of Planning, Design, and Construction
General Services Building
National Zoological Park
3001 Connecticut Avenue, NW
Washington, DC 20008

2. SUMMARY OF WORK

2.1. The Contractor shall furnish all supervision, labor, materials, and equipment needed to do the project work at the following locations at the Smithsonian Institution's National Zoological Park (NZP) located at 3001 Connecticut Ave NW Washington DC 20008:

2.2. The work includes but is not limited to:

- Modernization of the Electronic Security System at the NZP Veterinarian Hospital, Quarantine Building, and Necropsy Building including tie-in at Research Building.

When contractor has completed and checked his work, then contact COTR for an inspection. Contractor shall clean up and dispose all debris associated with job. Contractor will be responsible for all labor, materials, and equipment to complete project.

This brief description, however, shall not, in any way, be construed to limit the Contractor's obligation for compliance with the contract specifications.

2.3. Critical Elements of the Work: The successful Contractor shall be fully qualified to install critical elements of the Work. Upon request of the Contracting Officer, bidders shall submit a statement of qualifications to address the following critical elements of the Work:

- General Contractor and Subcontractor's supervisor shall have a minimum of five (5) years' experience with the materials and processes being installed.
- Experience with coordinating complex projects within an operating campus.
- Corporate climate that has a full commitment to the project's Safety Program.
- Quality Control program that ensures all of the project's exceptions are delivered within contract's conformance requirements. This program should include the contractor's ability to field review documents, implement testing procedures and ensure that the contract standards are fully adhered to.

2.4 Additional Contract Documents:

Sheet #	Description	Date
		00/00/00

3. CONTRACT TIME FOR COMPLETION

3.1 Work under this contract shall begin by the Contractor within seven (7) calendar days after the Notice to Proceed and shall be completed within the total contract time of 182 calendar days. All work, including inspections, testing, correction of deficiencies, and project close-out activities, shall be completed in every respect within the contract time.

3.2 The start date and completion date shall be as stated in the Notice to Proceed issued by the Contracting Officer.

4. SCHEDULE OF OPTIONS FOR BID

4.1. The following is a brief statement of the Work identified for bid options. The complete description of the Work is identified elsewhere in the drawings and specifications.

BASE BID:
Modernize the Electronic Security System at the NZP Veterinarian Hospital, Quarantine Building, and Necropsy Building.

5. SCHEDULE OF UNIT PRICES – NOT USED

6. BIDDER/OFFEROR EXAMINATION OF SITE

6.1. Every effort was made to indicate all work necessary to complete the project as identified. All bidders must carefully examine the premises during the bid period and satisfy themselves as to the extent, nature and location of the work, general and local conditions, particularly those bearing on transportation, disposal, handling and storage of materials, availability of labor, water, electric power, access routes, uncertainties of the weather, type of equipment and facilities needed for the successful execution of the Work.

6.2. Pre-Bid Conference and Site Visit. Before the bid opening date, the COTR will announce a scheduled pre-bid conference and site visit. The purpose of the scheduled meeting is to provide an opportunity for all bidders to review the project site. Any comments, information or discussion during the site visit shall not modify the contract documents. All questions must be submitted in the form of an RFI to the designated representatives on the RFP.

6.3. This project requires special arrangements for access to a non-public area. Access to the site may be restricted at times other than during the scheduled visit. Coordinate access with COTR.

7. AVAILABILITY OF DOCUMENTS

7.1. The bidders will be provided electronic versions of drawings and specifications from:

Smithsonian Institution
Office of Planning, Design, and Construction
600 Maryland Avenue, SW., Suite 5001
Washington, DC 20024

7.2. The bidder is responsible for making their own hard copies of the solicitation documents.

SECTION B - SPECIAL PROJECT REQUIREMENTS

8. UNITS OF MEASURE

8.1. All fabrication and installation shall be performed in accordance with the units of measure given in the Contract Documents. Units of measure on this project are Imperial Units.

9. NON-PUBLIC, TENANT AND SECURED SPACES

9.1. Certain tenant spaces, non-public spaces, utility and equipment rooms and other areas related to or used for purposes of storage, conservation, research, curation of NZP collection and artifacts or for scientific research may have restricted access.

9.2. The Contractor shall identify to the COTR as soon as possible, but no less than two (2) workings days in advance, any occupied areas that the Contractor must access that are located outside the limits of the project site. The Contractor shall identify in writing:

9.2.1. Restricted areas to be accessed.

9.2.2. Specific reason for needing access.

9.2.3. Nature of the work to be performed.

9.2.4. Date(s) and hours needed to complete construction work activity.

10. NZP ARTIFACTS AND SCIENTIFIC RESEARCH MATERIALS (NOT USED)

11. PROTECTION OF HISTORIC PROPERTIES

11.1. The project site is located in a designated National Historic Landmark property and requires special attention to the quality of materials selected for installation and workmanship efforts to satisfactorily preserve and restore historic elements and finishes of an historic landmark structure.

11.2. Upon request of the COTR, the Contractor shall submit evidence of technical competence in restoration work for National Historic Landmark structures, including subcontractor resumes, references and photographs or previous similar work.

11.3. Without exception, all original building fabric of the National Zoological Park is designated historic.

12. COMMITMENT TO SUSTAINABILITY

(This is not a LEED project however Construction Waste Management and Disposal in Section 29 will apply.)

12.1. The Smithsonian Institution is a trust instrumentality of the United States (recognized as a tax-exempt organization under Section 501(c)(3) of the Internal Revenue Code) and although not an Executive Branch of the U.S. Government, is committed to planning, designing, constructing, maintaining and operating its owned and leased buildings and facilities consistent with Federal environmental and energy management requirements, as listed in the Smithsonian SF Codes, Standards and Guidelines document, dated February 15, 2012, to the maximum extent practical.

13. COMMISSIONING – N/A

SECTION C - CONTRACTOR USE OF PREMISES

14. HOURS OF WORK, WORKDAYS AND GOVERNMENT HOLIDAYS

14.1. Work shall be performed, under this contract, during the normal workdays of Monday through Friday, except Smithsonian holidays and special events as specified herein and the normal work hours of <TBD at Pre-construction Meeting>. The NZP opens to the public at 8:00 a.m. daily, and use of public trails, roads, walks, etc. are limited during public hours and during special events. Coordinate with COTR.

14.2. The premises will be continually occupied, requiring that certain work under this contract may need to be performed during periods other than that specified above. All shutdowns and outages must be approved by and coordinated with the COTR and occur between the hours of 10:00 p.m. to 5:00 a.m., unless otherwise approved.

14.3. For each occasion, the Contractor intends to work on Saturdays, Sundays, or Smithsonian holidays or during hours other than those indicated above, the Contractor shall obtain written permission from the COTR, at least three (3) working days in advance.

14.4. The Contractor shall reimburse the Smithsonian Institution for security and inspection services provided by the Smithsonian when the Contractor chooses to work outside the normal workdays and hours, as identified herein. However, the Contractor will not be charged for NZP overtime security and inspection services, if in the opinion of the COTR, the work cannot be done during the normal workdays and hours due to requirements of the Smithsonian.

14.5. Smithsonian Holidays: For holidays that fall on Saturday, the Smithsonian holiday is observed on the previous Friday. For holidays that fall on Sunday, the Smithsonian holiday is observed on the following Monday. The Smithsonian Holidays are listed below. Also see the National Zoological Park website for a listing of special events.

New Year's Day	January 1
Martin Luther King Jr.'s Birthday	January, third Monday
George Washington's Birthday	February, third Monday
Memorial Day	May, last Monday
Juneteenth	June 19
Independence Day	July 4
Labor Day	September, first Monday
Columbus Day	October, second Monday
Veterans' Day	November 11
Thanksgiving Day	November, fourth Thursday
Christmas Day	December 25
President's Inauguration Day	January 20, 2025

15. CONDITIONS AFFECTING CONTRACTOR'S WORK

15.1. Existing Occupied Spaces: The premises will be occupied by visitors, staff, and collection animals during the performance of the Work. The Contractor shall schedule work activities to minimize interruption of occupants and occupied spaces. Efforts will be made to temporarily move employees and contents out of specific areas under construction, as needed, during the times requested by the Contractor. However, the needs of the Smithsonian Institution take precedence and free access for the Contractor cannot always be guaranteed. The Contractor may work in animal areas*only in the presence of authorized Smithsonian staff or guard personnel. Areas that will remain occupied include the grounds of the NZP.

15.1.1 Contractor to develop a work plan that incorporates all elements of paragraph 2.3.

15.1.2 Exhibit closures and shifting of animals between exhibits and holding spaces are to be coordinated with COTR and Animal Care staff with a minimum of 14 days of notice.

15.1.3 Area must be free from any debris, tools, equipment, etc. and animal containment must be in place prior to animals being shifted to that area.

15.1.4 Contractor to confirm prior access daily in primary and secondary containment area unless the area has been fully turned over to the contractor.

15.2. Relocation of Existing Occupants: N/A

15.3. Space for Contractor Use: The space available for Contractor's use shall be coordinated with COTR at the project site. Space allocation and availability are subject to change, at the discretion of the Smithsonian, to meet the needs of all parties requiring access and space within the building, work area, and the surrounding areas.

16. CONTRACTOR CONDUCT, DELIVERIES, HAULING AND ACCESS

16.1. Normal deliveries shall be made between the hours of 6:00 AM and 09:00 AM. The Contractor's materials and equipment shall be delivered, received, receipted for, and handled by the Contractor's personnel.

16.2. Access to the site for on- and off-loading of all material, structures and equipment shall be designated by the COTR .

16.3 SI's loading docks and delivery areas require special access requests and coordination for contractors use.

16.4 Comply with **NZP's Motor Vehicle Operations on Walkways**, responsibilities, and procedures for operating motor vehicles on walkways of the National Zoological Park (NZP) in Rock Creek.

16.4.1 **Definitions:**

Walkways. Interior paths on NZP grounds at Rock Creek intended for pedestrian visitors and staff, such as Olmsted Walk, Asia Trail, and American Trial.

Motor vehicle. Any motorized, gas or electric apparatus used to transport personnel or supplies, with the exception of individual motorized electric wheelchairs, or what are commonly known as Electric Control Vehicles (ECVs) and Police Segways.

16.4.2 **POLICY.**

Any motor vehicles on the grounds shall be operated at a speed considered safe for movement among pedestrians. The posted speed on Zoo public roadways is 25 miles per hour from Connecticut Avenue to the Crossroads, 15 miles per hour from the Crossroads to Adams Mill gate and 10 miles per hour from Adams Mill gate to the Veterinary hospital. Speed limits may be reduced during construction and special events. Caution is required as pedestrians must cross public roadways when walking from parking lots to the Zoo exhibits.

i. Walkways are for the main purposes of providing safe movement of pedestrians throughout the Park's exhibit areas. Vehicular traffic on walkways is restricted to an absolute minimum needed to accomplish the NZP mission. Contractor vehicles whose business requires that they

drive on walkways shall proceed with **extreme** caution. Individuals operating vehicles on walkways must remain constantly vigilant and be prepared to react quickly, if necessary.

ii. On walkways, vehicles shall be operated at a safe speed appropriate to the circumstances, never exceeding the equivalent of 5 miles per hour after 09:00 a.m. Prior to 09:00 a.m., vehicles below 26,000 lbs. gross vehicle weight rating (GVWR), may reach a maximum of 10 miles per hour. If installed, the vehicle's headlights and emergency flashers shall be on at all times.

iii. Motor vehicles are prohibited on all zoo walkways between the hours of 09:00 a.m. and 6:00 p.m. year-round, with limited exception (see part 5 below). During the restricted hours between 09:00 a.m. and 6:00 p.m., a police escort shall be requested by contacting the police supervisor on duty at 633-4111. If NZP Police cannot escort the vehicle, the driver must arrange a pedestrian escort by a suitably trained person to be in front of the vehicle with a safety vest or flag.

iv. Privately owned vehicles (POVs) must be off zoo walk-ways by 7:00 am.

v. All carts (including but not limited to; EZ Go, Gator, Club Car, and Cushman) must use an approved chock to keep the cart secured when not in use.

vi. Any individual operating a motor vehicle on NZP grounds must possess a current valid government issued driver's license.

2. RESPONSIBILITIES

i. SI Staff ensures that:
   1. Police officers observe and enforce the provisions of this directive.
   2. A police escort is provided whenever possible if needed for safe transit of a vehicle on walkways.
   3. All SI Staff shall take corrective actions when they observe violations of this directive and shall report the violation to the COTR.

3. CONTROLLING TRAFFIC ON WALKWAYS

i. Vehicular traffic and parking are prohibited on zoo walkways between the hours of 10:00 am and 6:00 pm each day, with limited exceptions (see below). Deliveries should be scheduled whenever possible before 10:00 a.m. if access to walkways is required.

ii. The following vehicles are permitted on zoo walkways during the period of prohibition if they are escorted by a uniformed NZP Police or other approved escort (who must walk in front of the vehicle wearing a brightly colored safety vest or signaling caution with flags and voice notification).

iii. Police vehicles, as deemed necessary for security or emergency purposes. No escort required.

iv. Park Management and OFEO vehicles responding to an urgent maintenance requirement or an emergency with an escort.

v. Veterinary vehicles responding to an animal emergency or a situation involving animal welfare with an escort.

vi. Any motorized cart needed to perform a vital duty must request approval from the COTR.

vii. Contractors must use vehicles to perform essential services within the prohibited hours must get approval from the COTR. When there is a need to bring in a company trucks, oversized vehicle, i.e., dump-truck, cranes, or other special equipment, at least two walking escorts must be provided. One forward and one aft with flags and safety vests; this also applies whenever this type of equipment has to back-up or perform any other special maneuvers, i.e., loading, unloading, lifting, dumping and so forth outside the designated work area.

viii. NZP Police, NZP, FONZ and OFEO senior staff have the authority to stop any motor vehicle operating on a walkway and determine whether or not such operation is in violation of policy.'

ix. In instances where the motor vehicle's operations do not meet the criteria for being on the walkway, the Police or NZP Senior Staff member may direct the driver to remove the motor vehicle from the walkway and proceed to the nearest available NZP roadway or street. Failure to comply with this policy, or to follow this sub-part instructions could lead to disciplinary action.

x. The Police may stop and expel from the walkway any vehicle exceeding the speed limit, operating the vehicle in an unsafe manner, or not in compliance with this policy. The following situations create unnecessary risk and will not be tolerated while operating a motor vehicle on pathways in the Zoo:

    1. Talking, texting, or using devices that require manual manipulation.

2. Eating or drinking.
3. Smoking by the operator or a passenger in any motor vehicle as referenced in the Smithsonian Directive (SD 209).
4. Exceeding the maximum seating capacity or design of the vehicle.
5. Transporting personnel in cargo area or failure to secure load.
6. Operating any vehicle with a visible or known safety defect.

17. DRESS AND DEPARTMENT

17.1. Contractors' personnel shall be fully and appropriately clothed at all times and shall conduct themselves in a manner appropriate to a public place. The COTR may require removal of any individual from the premises and project for unacceptable dress, demeanor, or disruptive conduct, if the Contractor superintendent fails to correct conditions in violation of this paragraph.

17.2. The Government reserves the right to exclude or remove from the site or building any employee of the Contractor or Subcontractor as the Government deems incompetent, careless, insubordinate, or otherwise objectionable, or whose continued employment of the work is deemed by the Government to be contrary to public interest.

18. CONTRACTOR PARKING

18.1. SI will provide one (1) hang tag permit for one (1) parking space for one (1) registered company vehicle to be parked in Lot C at no cost to the contractor. This vehicle must be clearly marked with a company name and/or logo. The hang tag must be hung from the vehicle’s rear-view mirror in clear view. Employee should use a SI issued Contractor’s Badge for daily lot access.

18.2. With 48 hours prior notice, the Contractor may request for one (1) vehicle, registered to the company, with identifiable signage to park in the gravel parking lot which is adjacent to Lot C at no cost.

18.3 Upon request SI will provide up to 15 hang tags on a monthly basis for parking spaces for the contractor’s personal vehicles. To obtain the hang tags the contractor must pay in advance with one company check, at rate of $15 per working day. Issued hang tags must be hung from the vehicle’s rear-view mirror in clear view. The exact location of the on-campus parking will be determined NZCBI Park Management on a monthly basis.

18.3 General Parking is available at $30 per day. For arrivals prior to 8:00 AM a parking pass must be purchased online a minimum of one day in advance. After 8:00

AM payments are to me made to parking attendants in the vehicle check-in lot bus lot. Early arrival parking vouchers must be to be printed and displayed in the windshield for identification.

18.4 All Vehicles not in compliance with NZCBI Parking Requirements are subject to ticketing and towing by the Smithsonian Police. All costs associated with parking violations shall be the sole responsibility of the Contractor's personnel**.**

19. EATING, DRINKING, SMOKING, AND ILLEGAL SUBSTANCE USE

19.1. Eating and drinking in Smithsonian buildings or leased space will be allowed only in designated areas. Offenders may be subject to removal from the premises and project should the Contractor's Superintendent fail to correct conditions, which, in the opinion of the COTR, violate this clause.

19.2. Gambling and the consumption of alcoholic beverages by the Contractor's personnel is prohibited in all Smithsonian buildings or leased space.

19.3. Smoking, vaping, using E-cigarettes or carrying lighted tobacco products is prohibited in all Smithsonian buildings or leased space, in exhibition and public spaces, in areas where hazardous materials are stored or handled and in areas undergoing construction, renovation or repair. Acceptable areas for smoking are outside of the building, as designated by the Smithsonian Facility Manager, and/or Office of Safety, Health, and Environmental Management (OSHEM).

19.4. The possession, sale and/or use of narcotics or other illegal substances or firearms by Contractor employees are strictly prohibited in all Smithsonian facilities and leased space. Contractor employees are strictly prohibited from working on the project under the influence of alcohol and/or illegal substances. Contractor employees in violation of any of the above prohibitions will be removed from the project.

SECTION D - PROJECT COORDINATION

20. COORDINATION OF TRADES

20.1. The Contractor shall coordinate work of different trades so that interference between mechanical, electrical, architectural, and structural work, including existing services, shall be avoided.

20.2. Refer to MasterSpec (AIA) Division 01 sections on General Commissioning Requirements following this section 010000.

20.3 Where work by separate entities requires off-site fabrication of products and accurate interfacing of materials to produce the required results, the Contractor shall prepare coordination drawings to indicate how work shown on separate shop drawings will be interfaced, intermeshed, and sequenced for installation. Coordination drawings shall be submitted in accordance with the requirements of the "Submissions" section.

20.3.1. Work installed prior to approval of coordination drawings shall be at the Contractor's risk. Subsequent relocations required to avoid interferences shall be made without additional expense to the Smithsonian. If an interference develops, the COTR will decide which work shall be relocated, regardless of which was installed first.

20.4. Installation of equipment and systems shall allow the maximum practical space for operation, repair, removal, and testing, within the limits indicated on the Contract Documents. Pipes, conduit, ducts, and other system components shall be installed as close as possible to ceiling slabs, walls, and columns to minimize space used while accommodating function and maintenance.

21. QUALITY CONTROL

21.1. The Contractor shall provide qualified site personnel responsible for quality control, inspections, testing and re-testing as necessary for all work, including that of Subcontractors, to assure compliance with the contract documents. CQC Representative may be the project’s designated supervisor.

21.2. Testing Requirements: Contractor shall be responsible for all field sampling and in-place testing required by the contract documents (this statement supersedes all other section references)

21.2.1. Independent Testing Laboratory: The Contractor shall provide an independent, commercial testing laboratory to perform all sampling and testing services required. The testing services shall be on- or off-site as required. Submit complete documentation of all tests performed in connection with the construction contract.

21.2.2. Smithsonian Acceptance of Laboratories: Except for factory tests, all field sampling and testing normally performed by commercial laboratories shall be performed by an independent commercial laboratory employed by the Contractor and accepted by

the COTR. The Contractor shall submit the following information to the COTR for approval:

21.2.2.1. Name, registration number and engineering discipline of the Registered Professional Engineer in charge of the laboratory.

21.2.2.2. Affidavit of compliance and certification that the laboratory performs work in accordance with requirements as stated in the contract documents.

21.2.2.3. A list of testing equipment proposed for each test procedure including latest calibration data.

21.2.2.4. A copy of the latest Laboratory Inspection Report by an independent agency with laboratory certification that deficiencies (if any) have been corrected.

21.2.2.5. Names and qualifications of persons actually performing testing and sampling. Changes in personnel shall be approved by the COTR prior to performance of work under this contract.

21.3.4. Test Results: Test results shall cite the contract requirements; the test or analytical procedures used the actual results and include a statement that the item tested or analyzed conforms or fails to conform to specification requirements. The cover sheet for each report shall be conspicuously stamped in large red letters "CONFORMS" or "DOES NOT CONFORM" to the specification requirements, as the case may be. All test reports shall be signed by a testing laboratory representative authorized to sign certified test reports. The Contractor shall arrange for immediate and direct delivery of the signed reports, certifications, and other documentation to the COTR.

21.8. Documentation: The CQC shall prepare the following documentation for systematic inspection, testing, and verification of various aspects of the deliverable project. Documentation should include but not limited to: (1) Establishing Quality Standards, (2)Setting Acceptance Criteria, (3)Implementing Quality Control Measures, (4)Monitoring Process Performance and (5)Identifying Defects and Non-Conformities.

21.8.1 Submittal Review: Prior to submitting information to the Smithsonian, the CQC shall review and sign all submissions. This signature confirms a detailed submittal review for coordination and compliance has been conducted on behalf of the General Contractor.

21.8.2. Daily Reports: The Contractor's Daily Report, as discussed in the section Contractor Correspondence and Daily Reports, shall be signed by the CQC Representative as well as the Superintendent. The CQC Representative's signature certifies that, to the best of his or her knowledge, the report is complete and correct and that all materials, equipment and work described on the report are following the contract plans and specifications, except as noted otherwise.

21.8.3. Special Inspection and Documentation: Reports of Special Inspections shall be signed by both the CQC Representative and the CQC Specialized Supplemental Person who witnessed the test or inspection certifying compliance with the specific contract requirement.

21.8.4. As-Builts: The CQC Representative shall ensure that all requirements for as-built record drawings and specifications are met. The CQC Representative or Specialized Supplemental Personnel assigned to inspect that particular portion of work shall initial each as-built drawing or technical specification section to certify its accuracy prior to submission in accordance with the Project Close-Out Requirements section.

22. PERMITS, LICENSES & FEES

22.1. The Contractor shall obtain and pay for all applicable permits and licenses required by D.C. regulating agencies, including but not limited to storm water management, water quality as it relates to Rock Creek disturbance, elevator permits, etc.

22.2. The Contractor shall pay all duties, fees, taxes, and other charges and give all notices necessary and incidental to the due and lawful execution of the work.

22.3. The Contractor shall keep the Smithsonian indemnified against all penalties and liability for breach of provisions of any national, provincial, district or city statute, ordinance or law and the regulations and by-laws of any local or other duly constituted authority, which may be applicable to the Work and with such rules and regulations of public bodies and companies.

22.4. Accessibility for Physically Disabled Persons: The Contractor's shall provide temporary constructions at the site as necessary to maintain access for physically disabled persons. All provisions for temporary access shall be subject to the approval of the COTR.

23. UTILITY SERVICE INTERRUPTIONS AND NEW CONNECTIONS

23.1. Any planned interruption in utility service must be approved by and coordinated through the COTR. The Contractor shall submit a written request as far in advance of scheduled interruption as possible, but no less than two (2) full working days in advance. The Contractor shall make the necessary temporary provisions to supply continuous electrical power, HVAC space conditioning and security as required during periods when service is interrupted.

23.2. Work shall be coordinated to minimize the number and duration of outages.

23.3. All planned shutdowns and outages must occur between the hours of 6:00 p.m. to 6:00 a.m., unless otherwise approved by the COTR.

23.4. The Contractor's work efforts to restore service shall be continuous until the interrupted utility is back in service.

23.5. The electrical power for may not be interrupted without advanced coordination with the COTR.

23.6. A fire watch shall be provided for the time periods when fire suppression and detection systems are out of service.

24. SI-FURNISHED ITEMS INSTALLED BY THE CONTRACTOR

24.1. The following items shall be furnished by the Smithsonian for installation by the Contractor as part of this contract:

ITEM	DELIVERY LOCATION
Not Applicable	

24.2. Required delivery dates for all Smithsonian furnished items shall be included in the Contractor's Project Schedule, as discussed in the Schedules and Payments section. Any items requiring delivery within the first sixty (60) days of the project or prior to submission of the Project Schedule shall be identified at the Preconstruction Meeting.

24.3. The COTR will notify the Contractor of scheduled delivery dates no less than two (2) full working days in advance of delivery. The Contractor shall accept delivery of the items on scheduled dates or be responsible for any damage and/or expenses resulting from his failure to take delivery. Promptly upon delivery, the Contractor shall contact the COTR, and they shall jointly inspect the material or equipment for possible shortage or damage. If a shortage or damage is found, the Contractor and the COTR shall submit a report to the Contracting Officer.

24.4. The Contractor shall be responsible for proper storage and protection of items delivered, including all expenses incidental thereto.

24.5. For each item, the Contractor shall receive, sign for receipt, provide additional transportation as necessary, uncrate, assemble, locate in place, and provide complete installation including all connections necessary for operation or use. Installation and connection shall be in accordance with manufacturer's specifications as well as contract documents, including all labor and material required.

25. SALVAGE

25.1. The Smithsonian Institution assumes no responsibility for salvage value or any loss or damage to materials or structures on the site for which the Contractor may have reflected a salvage value in his or her offer.

25.2. Except as specifically stated in the contract documents, construction materials, equipment or other items that are to be removed and neither re-used under this contract nor reserved as property of the Smithsonian Institution shall become the property of the Contractor and shall be removed from the premises by the Contractor.

26. CUTTING, PATCHING AND MATCHING EXISTING WORK

26.1. Existing work shall be cut, drilled, altered, removed, or temporarily removed and replaced as necessary for performance of work under the contract. Work that is replaced shall match similar existing work. Structural members shall not be cut or altered, except where noted on drawings, without authorization of the COTR. Work to remain in place, which is damaged or defaced during this contract shall be restored to match the conditions existing at the time of award of the contract, at no additional cost to the Smithsonian.

26.2. Conditions exposed by removal of existing work that do not match new finishes or align with new work shall be called to the COTR's immediate attention. Necessary corrective work directed by the COTR will be subject to adjustment provisions as stated in the General Conditions of the contract.

SECTION E - PROTECTION OF THE SITE DURING CONSTRUCTION

27. PROTECTION OF THE SITE

27.1. The Contractor shall provide adequate protection for all parts of the building, including interior and exterior surfaces, its occupants, contents, and grounds wherever work under this contract is performed.

27.2. Plan for Protection of the Site: The Contractor shall submit a plan for protection of the site to the COTR for approval. The plan shall be submitted no less than five (5) working days after the Preconstruction Meeting. As a minimum, the Plan shall describe:

27.2.1. Proposed method, location, and construction of temporary enclosures.

27.2.2. Routes of access and egress, including those for people with disabilities.

27.2.3. Location and maintenance of emergency exits.

27.2.4. Methods of protection of existing surfaces and occupants.

27.2.5. Means of connection of temporary enclosures/surfaces to existing historic materials.

27.3. During construction, temporary enclosures shall be constructed to prevent unauthorized access or egress. Dust and fume barriers shall be constructed, as needed, or as determined by the COTR, to seal and isolate the work area from the remainder of the interior areas while the work is in progress. Wood used for protection of the site shall be pressure-impregnated, fire-retardant. All plastic sheeting shall be fire retardant 6-mil polyethylene. Submit product data to the COTR for review and approval.

27.4. The Contractor shall submit information describing the proposed construction of temporary enclosures and methods of installation to the COTR for approval. Any connections to existing structures must be accomplished in such a way as to minimize disturbance of existing surfaces.

28. PROTECTION OF FLORA, FAUNA, AND IRRIGATION SYSTEM

28.1. Flora Protection: The Contractor is expressly prohibited from collecting plant materials on Smithsonian property.

28.2. The Contractor shall not store materials inside the dripline of trees or shrubs. Prior to the start of the work on site, the Contractor shall surround trees within the project site and adjacent areas with a protective 6-foot-high chain link fence located 1 foot minimum outside the drip line.

28.3. Vehicular traffic inside the dripline of trees, on turf areas or on flowerbeds is not permitted without prior approval of the Smithsonian's Department of Horticulture through the COTR. If flowerbeds must be crossed by vehicles, bridging is required. Bridging shall be 100 mm

thick timbers 2 layers of ¾ inch exterior grade plywood or 2" x 10" or 1" protective plastic decking such as Bravo mat or equal to help prevent soil compaction of the soil in the lawn areas and flowerbeds. Any turf area used for parking with prior approval as noted above must first be planked by the Contractor.

28.4. Where aerial work is being performed above flower/shrub beds, the Contractor shall protect them with an approved protective framework installed at least 300 mm above the tops of the plant materials. The Contractor shall submit the proposed method of protection to the COTR for approval. Trees and shrubs shall only be tied back with the approval of the COTR.

28.5. Any damage to the existing irrigation systems during construction shall be repaired by the Contractor within two calendar days from when the damage occurred.

28.6. NOT USED

28.7. The Contractor shall bear all costs for repairs to the damaged irrigation system. Where the low voltage control wiring is damaged due to construction, then said wiring shall be replaced from the zone valve to controller. No splicing will be permitted.

28.8. Identification tape, when damaged, shall be replaced with an identification wire from valve to controller.

28.9. All damaged irrigation piping shall be cleared of debris prior to making the connections.

28.10. The Contractor shall bear all costs for replacement of damaged plant materials. Replacement plant materials shall meet the criteria established by the NZP's Department of Horticulture.

28.11. Plant material removed by the Contractor for reuse shall be balled, bagged, and protected in accordance with instructions prepared by the NZP's Department of Horticulture.

28.12. Turf areas damaged during construction shall be repaired by the Contractor by rototilling a minimum depth of 6 inches, backfilled with sandy-loam topsoil. Sod shall be certified sod, none netted and a minimum of one year old. Sod shall be 90:10, consisting of a minimum of three varieties tall fescues and one Kentucky Bluegrass. The NZP's Department of Horticulture, through the COTR, must approve the source of the sod. The Contractor shall bear all costs for these repairs. Suggested sources are:

Oakwood Sod Farm, Inc.
29307 Waller Road
Delmar, MD 21875
Phone: (410) 896-4009
Toll-Free: (800)379-8488

Collins Wharf Sod
25361 Collins Wharf Rd

Eden, MD 21822
Phone: 410-334-6676
Fax: 410-749-3815
cwsod@collinswharfsod.com

Summit Hall Sod Farm
21300 River Road
Poolesville, MD 20837-9114
Phone: 301-948-2900
Fax: 301-349-2668

28.13. The Contractor shall be responsible for the daily removal of trash and construction debris from turf and flower/shrub beds within the limits of construction.

28.14. Any plant material destroyed and/or damaged by the Contractor during construction shall be replaced with like genus and species of the same size, at no additional cost to the Smithsonian. The damaged plant materials must be replaced prior to final payment. The same applies to artifacts or furniture collection pieces. The COTR requires five (5) working days' notice should any of the artifacts or furniture collection need to be removed to facilitate construction.

28.15. Any construction scaffolding on turf and planted beds must be coordinated with the NZP's Department of Horticulture, through the COTR, to ensure that its installation will not damage or destroy existing plant materials or turf area or interfere with daily maintenance of the grounds. Trees may be tied back to permit scaffolding erection, no more than 4 feet if possible. The tying back must be performed by a certified Arborist with the approval of NZP's Department of Horticulture through the COTR. Where scaffolding is necessary to facilitate construction, NZP's Department of Horticulture requires a three (3) workday notice for said work.

28.17. Fauna Protection: The Contractor is prohibited from hunting, collecting, or feeding animals on Smithsonian property. All food and food wrapping brought on the premises must be properly disposed of in approved containers, which are secured from animals.

28.18. If a generator is placed on the turf, Contractor must have the COTR's approval of its placement. Generator shall be placed on anti-compactor boards. The generator must be placed in a drip containment basin.

28.19. A schedule of values for plant material is not required.

28.20. Use requirements for 28.21 topsoil, 28.22 screened leaf mold, 28.23 soil mix aggregate, and 28.25 ground limestone when any of the following conditions occur:

a) When landscaping is part of the work, but a separate soil spec is not provided
b) When a Contractor has damaged an area that includes soil or landscaping and is to be repaired
c) For backfill as noted under 28.24

28.21. Topsoil: ASTM D 5268, fertile, naturally sandy loam as defined by USDA Handbook no. 18, Figure 38. It shall be natural, surface soil in a friable condition and contain less than 3% subsoil. The topsoil shall be free of hardpan material, stones, and clods larger than ½ inch in diameter, sticks, tree or shrub roots, debris, toxic substances (e.g., Residual herbicides) and other material detrimental to plant growth. The area and the topsoil shall be free of plant or plant parts of undesirable plants such as, but not limited to, Bermuda grass, nut sedge, mugwort, Johnson grass, Quack grass, Canada Thistle, or noxious weeds as set forth in the Federal Seed Act. It shall be certified free of Southern Blight.

28.21.1 Contractor shall notify COTR of location of all sources of the topsoil and furnish the COTR a certified report from the agricultural experiment station or approved agricultural laboratory of an analysis performed not more than 60 days prior to the date of submission. If the topsoil is a mix, it shall be mixed off-site. The topsoil shall be certified to meet the following requirements:

a. Shall be a natural, original surface soil of a sandy loam texture with a mechanical analysis of 60-65% sand, 15-25% silt and 10-15% clay.

b. Shall have at least 2%, but not more than 5%, organic matter.

c. Soil pH shall be 5.5 to pH 6.5 inclusive unless otherwise specified.

d. Soil salinity by electrical conductivity measurement shall not exceed 600 parts per million (ppm) as determined by Black, Editor “Method of Soil Analysis,” Part 2, published by the American Society of Agronomy, 1965.

e. The soil nutrient level shall be greater than 100 lbs./acre of magnesium, 150 lbs./acre of phosphorous and 120 lbs./acre of potassium.

28.21.2. Agricultural limestone at not more than 5 pounds per cubic yard of topsoil may be used to adjust an acidic condition provided it is well mixed in a manner, which does not destroy the structure of the soil.

28.21.3. Topsoil that has been synthesized by blending materials which individually do not meet the requirements of this specification will not be accepted even though the resulting blend meets the organic matter, mechanical analysis, pH, and soluble salts requirements.

28.21.4. The COTR reserves the right to inspect and sample all topsoil at the source and at the time of delivery. These inspections will be made without cost to the Contractor.

28.21.5. Topsoil must not be delivered or handled in a frozen or muddy condition.

28.21.6. Shipment and Delivery - All soil must be approved by the COTR before delivery

to the site. Any material not meeting requirements of this specification will be rejected on or after delivery.

28.22. SCREENED LEAF MOLD

As available through Maryland Environmental Services, 2020 Industrial Drive, Annapolis, MD 21401 (301/261-8596) or approved equal, completely composted, and free from all materials such as glass, paper, plastics, etc. Composted sewage sludge shall not be used.

28.23. SOIL MIX AGGREGATE

Aggregate shall be Solite 3/8 as manufactured by Solite Corp., 2508 Chamberlain Avenue, Richmond, VA or approved equal. Lightweight aggregate shall be expanded shale or slate expanded by the rotary kiln process. The aggregate shall meet the requirements of the American Society of Testing Materials C331-81 and C33-80.

28.24. BACKFILL

28.24.1 When existing soil is acceptable for use: Existing topsoil shall be used unless so directed otherwise by the COTR. The following mixture in accordance with the specifications herein, thoroughly mixed by volume shall be used as backfill:

6 parts existing soil
2 parts leaf molds
2 parts Solite #388

28.24.2. When existing soil is not acceptable for use: If so, determined by the COTR that the existing soil is not acceptable for use, the Contractor shall excavate all soil to a depth of 24 inches and disposed of off-site. The following backfill mixture, thoroughly mixed by volume in accordance with the specifications herein, shall replace the excavated soil:

60% sandy loam topsoil
20% Solite #388
20% Composted leaf mold

28.24.3. Backfill shall be mixed off site. If requested, backfill shall be mixed in the presence of the COTR. Backfill must be approved by the COTR before delivery to the job site.

28.25. GROUND LIMESTONE

Lime: ASTM C 602, Class T, agricultural limestone containing a minimum 80% calcium carbonate equivalent with a minimum 99% passing a No. 8 (2.36 mm) sieve and a minimum 75% passing a No. 60 (250 micrometer) sieve.

28.25.1. Provide lime in the form of dolomitic limestone.

29. DEBRIS CONTROL AND DAILY CLEANUP

29.1. The Contractor shall regularly clean up the work areas and shall, at all times, maintain the project in as neat and orderly a manner as is consistent with normal operations. Debris resulting from construction operations shall be removed from the site daily by the Contractor. The Contractor shall keep all access, haul routes and site areas free of dirt, debris and other materials resulting from construction activities.

29.2. Under no circumstances shall any rubbish or waste be dropped or thrown from one level of scaffolding to another or within or outside the building. Rubbish may be lowered by way of chutes, taken down on hoists or lowered in receptacles.

29.3. In addition to a general daily clean-up and removal of rubbish, the Contractor shall immediately prior to final inspection for completion and acceptance, or when directed by the COTR, have all surfaces swept and dusted, and all finished surfaces washed and in a new appearing condition with all stains, soil marks, dirt and other forms of defacement removed.

29.4. Trash receptacles: The Contractor shall provide enclosed trash receptacle(s) in quantity and size necessary to meet project needs, located as approved by the COTR. Trash receptacles shall be placed out of public viewing.

29.5. The Contractor shall recycle, salvage, or otherwise divert from landfills and incinerators, at least 50%, with a goal of at least 75%, by weight (tons), unless otherwise noted, of non-hazardous construction and demolition material. The contractor shall track recycling efforts and diversion rates using the Construction and Demolition Waste Tracking Sheet, attached. Before any work is started, the contractor shall submit a Construction Waste Management Plan, consisting of waste identification and a waste reduction work plan. Waste identification shall indicate anticipated types and quantities of demolition, site-clearing, and construction waste generated by the Work. Include estimated quantities and assumptions for estimates. Waste reduction work plan shall list each type of waste and whether it will be salvaged, recycled, or disposed of in landfill or incinerator. Include points of waste generation, total quantity of each type of waste, quantity for each means of recovery, and handling and transportation procedures. With each application for payment, the contractor shall submit the Construction and Demolition Waste Tracking Sheet, attached, with data compiled for the payment period, including receipts from hauler or destination. Before request for substantial completion, the contractor shall submit calculated end-of-Project percentage of waste diverted from landfills and incinerators (recycled, salvaged, or disposed) as a percentage of total waste generated by the Work. With request for final payment, the contractor shall submit actual percentage of waste diverted from landfills and incinerators (recycled, salvaged, or disposed) as a percentage of total waste generated by the Work. Refer to *Construction Waste Demolition Waste Tracking Sheet*, following this section.

29.6. All food and food wrappings brought on the premises must be properly disposed of in approved containers that are secured from animals and pests.

29.7 All project waste must go to licensed disposal or recycling facility such as a C & D Landfill. Contractor shall provide SI (generator) with documentation that all waste has been properly characterized and disposed of in accordance with applicable regulations and defined under the 40 CFR 261.2

30. DUST AND AIR QUALITY CONTROL

30.1. The Contractor will execute the Work by methods that minimize dust, vapors and gases raised by construction operations. The Contractor will utilize engineering controls and work practices to prevent airborne dust, vapors, gases, and objectionable odors from dispersing into the atmosphere and from being drawn into existing air-intake louvers, ductwork, and adjacent elevator shafts. A work plan of methods and means for this section shall be submitted to the COTR for review and approval.

30.2. Dust barriers shall be erected, where necessary, to protect adjacent areas from dust infiltration as required by the COTR. Dust barriers shall be rigid and visually opaque and shall seal the work area by affixing to the structure on all sides (i.e., ceiling, walls, and floor). Wood used for dust barriers shall be pressure-impregnated, fire-retardant treated lumber. All plastic sheeting shall be fire-retardant 6-mil polyethylene. Submit product data for review and approval to the COTR.

30.3. Means of connection of dust barriers to existing structures shall not damage the building fabric. Details of barriers shall be submitted for approval to the COTR.

30.4. No open fires or burning of trash are permitted.

31. NOISE CONTROL

31.1. The Contractor shall comply with the regulations of the District of Columbia and OSHA Standards 1926.52 and 1910.95 and all other regulations relative to safety noise control.

31.2. Activities that generate excessive noise or vibration and interrupt NZP functions or create public disturbances may be required to be performed during off-hours at the discretion of the COTR.

31.3. The Contractor shall provide sound attenuation to maintain acoustic level below 75 dBA at a distance of 15 m or below 75 dBA in occupied staff areas if less than 15 m away from noise source.

32. VERMIN, PEST, AND RODENT CONTROL

32.1. The Contractor shall use non-chemical means and practices that deter or prevent the introduction of pests into the project site or premises. No chemical means shall be permitted. Contractor’s focus should be NO FOOD DEBRIS on site with mandatory daily cleanup and removal.

33. DRILLING, WELDING TORCH CUTTING AND OTHER OPERATIONS THAT PRODUCE AIRBORNE CONTAMINANTS

33.1. Daily Permits:
When welding, torch cutting or other heating operations are to occur inside existing structures, the Contractor shall obtain a daily **HOT WORK PERMIT**.

During the course of the Work, all existing smoke and heat detectors and sprinklers heads must remain operable. Coverings may be applied to protect them from spray coatings or other hazardous conditions only during the actual operations. Coverings must be removed immediately after the operations have concluded, but at the end of each working day at a minimum. When work produces dust or other airborne contaminants, e.g., spray painting, that could impair existing fire suppression or detection system(s) or when the system itself is otherwise impaired (drained down, etc.), the Contractor shall obtain a daily **FIRE SYSTEM IMPAIRMENT PERMIT**. Each permit must be obtained at least two working days in advance from the COTR and posted at the job site prior to beginning the scheduled work.

33.2. Fire Watch: No welding or torch cutting shall be performed unless adequate fire protection is provided. The Contractor shall maintain a fire watch for the duration of welding, cutting, and heating operations and for at least 30 minutes after the 'hot' work has stopped. A fire extinguisher (minimum 10 pounds, dry-chemical type, typical) shall be on hand when drilling, welding, or cutting.

33.3. Use of Impact Hammers: The use of impact hammers or other equipment causing vibration, noise and dust may be harmful to collection animals and/or building occupants. The Contractor shall request approval from the COTR at least five (5) working days before beginning this type of work to ensure adequate time for notification of building occupants and protection of objects and collections.

33.4 Ventilation: The Contractor shall provide adequate ventilation to prevent air contamination or the accumulation of toxic materials. Take necessary measures to prevent welding fumes from entering mechanical ventilation systems, or passive transfer to adjacent areas. Seal all adjacent ducts and equipment openings with plastic. Where transfer is deemed likely or verified by the COTR, utilize local exhaust ventilation with HEPA filtration to control welding fumes. The Contractor shall submit means and methods for controlling air contamination to the COTR for review and approval.

SECTION F - TEMPORARY CONSTRUCTION FACILITIES

34. CONTRACTOR FIELD OFFICES, TRAILERS, AND SHEDS

34.1. The Contractor may establish a temporary office at the project site. The Contractor shall provide information about proposed locations of any temporary office, sheds, trailers and staging and storage areas and designation of size, color, and materials to the COTR for approval at least fourteen (14) days prior to mobilization.

34.2. The Contractor may provide his own locking device on the door to the temporary office, trailer or shed. The Contractor shall be solely responsible for the safekeeping and security of the construction facilities, materials, and equipment.

34.3. Upon completion of the Work, the temporary offices, trailers, and sheds shall be removed, and the area returned to its original pre-contract condition.

35. STAGING, STORAGE AND WORK AREAS

35.1. Staging and Storage Areas: The Contractor shall coordinate with the COTR the use of any area proposed for staging and storage of materials and equipment at least five working days prior to mobilization or at the Preconstruction Meeting, whichever is first.

35.2. The Contractor shall provide adequate storage and protection of materials and equipment delivered to the site to prevent theft, weather damage, mold infiltration, moisture damage and other physical damage. The site shall be maintained in a neat and orderly manner as to further minimize hazards to personnel, animals, visitors, materials, and equipment.

35.3. Plan for Staging, Storage & Work Areas: The Contractor shall submit a drawing of areas proposed for construction operations for approval by the COTR at least fourteen (14) days prior to mobilization or at the Preconstruction Meeting, whichever is first. The drawing shall show buildings, utilities, temporary toilet facilities, temporary utility extensions, temporary interior walls and barriers to limit unauthorized intrusion and to control noise and dust, pedestrian walkways, vehicular access, temporary fencing, trailers, sheds, storage areas and the Contract's desired route for access and egress to the premises and to the project site.

35.4. All wood used for temporary, interior construction shall be pressure-impregnated with a "Dricon" treatment or an equal treatment approved by the Smithsonian Institution. All pieces must bear the UL "FR-S" stamp. Intumescent (fire-retardant) paint shall not be used. All plastic sheeting shall be fire retardant 6-mil polyethylene. Submit product data to the COTR for review and approval.

36. SANITARY/TOILET FACILITIES

36.1. Contractors' personnel will be permitted to use designated public restrooms located on the premises, subject to the regulations and control of the COTR. If, in the opinion of the COTR, the Contractors' personnel fail to maintain acceptable dress and conduct appropriate to a public place, permission to use the public restrooms may be rescinded. In the event the project's location warrants temporary facilities the location and quantity of units shall be approved by the COTR.

37. TEMPORARY UTILITY SERVICES AND EXTENSIONS

37.1. Existing electrical, and water utilities are available for the Contractor's use as designated by the COTR.

38. SCAFFOLDING AND PLATFORMS

38.1. The Contractor shall erect temporary scaffolding in accordance with OSHA 29 CFR 1926.451 and ANSI A10.8. The Contractor shall provide landing platforms with stairways or ladders for proper access and egress to all work areas.

38.2. For all frame scaffolding greater than 4 m in height, the Contractor shall submit working drawings to the COTR a minimum of ten (10) working days in advance of scaffolding erection. Working drawings submitted by the Contractor shall be certified by a registered Professional Engineer. Provide additional safety plan and training certifications for any motorized scaffolding or lifts. Provide weight and size of any proposed motorized lifts for approval.

38.3. During non-working hours, the Contractor shall close and lock the scaffolding/lifts with a physical barrier to prevent access by unauthorized persons.

39. PROJECT SIGNS – N/A

SECTION G - MEETINGS

40. PRECONSTRUCTION MEETING

40.1. A Preconstruction Meeting will be scheduled with the Contractor before any work is started at the site. As soon as possible after the Date of Award, the COTR will contact the Contractor to arrange a time, date, and place for the conference. Items to be discussed at the Preconstruction Meeting include, but are not limited to:

40.1.1. Contract Time: Notice to Proceed date and Completion date.

40.1.2. Scheduling and Submittals.

40.1.2.1. Progress Schedule

40.1.2.2. Payment Breakdown Schedule

40.1.2.3. Required Submittals

40.1.3. Mobilization and Staging – Area for Materials and Equipment.

40.1.4. Access to the Premises, Haul Routes, Loading Dock.

40.1.5. Contractor Deliveries.

40.1.6. Security Requirements/List of Contractor's Personnel.

40.1.7. Emergency Procedures and Phone Numbers.

40.1.8. Protection of Site and Premises.

40.1.9. Fire Protection, Safety and Health Requirements.

40.1.10. Utility Interruptions, Rough-in Inspections, Testing.

40.1.11. Applications for Payment.

40.1.12. Pre-Condition Survey of the Site.

40.1.13. Accessibility Requirements.

40.1.14. Sequence of Construction.

40.1.15. Quality Assurance and Inspection of the Contract Work.

40.1.16. Sustainability Requirements.

40.1.17. Building Systems Commissioning.

40.1.18. Quality Control.

40.1.19. Preservation of Wildlife and Natural Resources.

40.2. All of the Contractor's staff and Subcontractors or Suppliers whose presence is necessary or requested by the COTR shall attend the Preconstruction Meeting.

40.3. Coordination Plan: The Contractor shall use the Preconstruction Meeting to develop a Coordination Plan for interaction with other parties working in or using the facility. The plan shall be submitted no less than five (5) working days after the Preconstruction Meeting and shall address interactions with other contractors, tenants, the public and any others making use of the site and surrounding areas. As a minimum it shall include:

40.3.1. Locations of overlap in use of the site by the Contractor and others, including work areas, delivery points, access/egress areas.

40.3.2. Specific items of work by others required to support critical milestones in the Contractor's schedule.

40.3.3. Completion or delivery of work by others that may impact the Contractor's schedule.

40.3.4. Portions of the work that create special hazards or disturbances.

40.3.5. Portions of the work that affect utilities, fire-protection or detection systems or security systems.

40.3.6. Events requiring access to areas outside of the project site or secured spaces.

40.3.7. Protection to be provided by the Contractor for work completed by others either before or during this project.

41. PRE-CONDITION SURVEY OF THE SITE

41.1. After the Preconstruction Meeting and before the start of work on the site, the project site (i.e., building, yards, contents, grounds, and equipment) shall be inspected by the Contractor, major Subcontractors, COTR and other Smithsonian Institution and NZP personnel as may be required for the purpose of verification of the existing conditions. Any damages or defective equipment will be noted at this time and this survey will serve as the basis for the establishment of the pre-contract conditions. The Contractor and Smithsonian Institution will jointly establish the identification of pre-contract conditions.

4.1.2. Any damage to the buildings, yards, their contents, grounds, or equipment that occurs during the contract period, unless noted as existing during the inspection as specified above shall be repaired to its pre-contract condition by the Contractor at no cost to the Smithsonian. The COTR will determine the adequacy of the repairs as required in the previous paragraph.

41.3. Written and photographic documentation: The Contractor shall prepare photographic presentation report in PDF format to identify all damages or defects of materials, equipment, and the site. The Contractor shall submit report electronically to the COTR before staring any work on site.

42. PROJECT MEETINGS

42.1. Progress Meetings: The COTR will lead regular progress meetings with an interdisciplinary integrated management team consisting of representatives (as required) of the Contractor, Smithsonian, Architect/Engineer, Commissioning Provider, major Subcontractors and other critical Subcontractors and suppliers. The purposes of these meetings are to expedite the work, coordinate and schedule the Work and coordinate the work with Smithsonian activities. Progress meetings shall be held weekly unless otherwise directed by the COTR. The time and place of the meetings will be established at the Preconstruction Meeting. The Contractor shall ensure that all required Subcontractors and suppliers attend the Progress Meetings and the COTR will ensure that all necessary SI personnel attend.

42.2. Special-Topic Meetings: At the discretion of the COTR, additional separate meetings may be scheduled to address issues of quality control, sustainability requirements, coordination between contractors on the premises, coordination with other agencies, scheduling of the work, application for payments, etc. The Contractor's staff and Subcontractors or Suppliers whose presence is necessary or requested by the COTR shall attend.

42.3. Meeting Minutes: The Contractor shall promptly prepare minutes of each meeting and transmit to the COTR, within five (5) working days.

SECTION H – SUBMISSIONS

43. SUBMITTAL DEFINITIONS

43.1. Submittals are defined to include shop drawings, product data, samples and additional data required for submission to the COTR for review and approval prior to incorporation into the work. All documentation transmission shall be electronic, unless otherwise requested.

43.1.1. Shop Drawings: Detailed drawings, schedules, diagrams, and illustrations prepared specifically for this project by the Contractor or any subcontractor, manufacturer, supplier, or distributor to illustrate fabrication and/or installation of a portion of the Work.

43.1.2. Schedule: A detailed tabulation of components, items, or parts to be furnished for use on this project.

43.1.3. Statement: An affirmation prepared by the Contractor, the installer or manufacturer of a material, product, or system, to satisfy a requirement defined in a technical section.

43.1.4. Factory Test Report: A written report of the findings of a test performed by the Contractor on an actual portion of the Work or prototype prepared for this project before it is shipped to the site.

43.1.5. Field Test Report: A written report of the findings of a test performed by the Contractor on a portion of the Work during or after installation.

43.1.6. Certificate of Compliance: A written statement, signed by an authorized official of the manufacturer of a product or system or supplier of a material attesting that the product, system, or material meets the requirements of the contract documents. The certificate of compliance must be dated after the award of this Contract and must name the project and cite the specification section, paragraph, and requirements, which it is intended to address.

43.1.7. Product Data: Illustrations, standard schedules, performance charts, instructions, brochures, diagrams, manufacturer's descriptive literature and catalog information illustrating a material, product or system to be installed on this project, including all data related to LEED requirements, such as recycled and regional content information, Volatile Organic Compound (VOC) product schedules, Forest Stewardship Council (FSC) chain-of-custody documentation and other documentation as requested by the COTR.

43.1.8. Color Charts: Pre-printed brochures showing the color range of a material.

43.1.9. Test Reports: Reports verifying that a material, assembly, system, process, or laboratory meets requirements established in the Contract Documents. Reports shall indicate compliance by naming and describing the test method and test results. Testing must have occurred within three (3) years of the date of award of this contract.

43.1.10. Samples: Physical examples of materials, equipment, assemblies, or workmanship establishing standards for evaluating finished Work.

43.1.11. Color/Texture Selection Sample: Samples of an available range of textures and/or colors of a material formed of the actual finish material over a substrate identical to that which will be used in the field.

43.1.12. Mock-up: An assembly or sample panel constructed in accordance with specifications to show construction details, finished appearance and/or performance.

43.1.13. Material Safety Data Sheets: Instructions, warnings and recommended and required handling and use procedures for individual hazardous materials published by the product manufacturer.

44. SUBMITTALS AND REVIEWS

44.1. Contractor Responsibility for Submittals: The Contractor shall provide all required submittals, by technical specification section, in accordance with the contract documents. All submittals, with exception of mockups or samples, are to be submitted electronically by email in PDF format. The Contractor shall clearly indicate on the submittal that it has been reviewed by the Contractor and found to meet the project requirements. Any items submitted as substitutions shall be clearly identified as such on the submittal and the transmittal document. If shop drawings show variations from the contract documents because of standard shop practices or for other reasons, the Contractor shall provide a separate, written description of variations along with the submittal. The Contractor shall:

44.1.1. Review each submittal for conformance with requirements of the contract documents and coordination with related work.

44.1.2. Determine and verify all field measurements, required material quantities, method of assembly or erection, installation requirements and proper connection to adjoining materials installed by others.

44.1.3. Assure that all submittals use the appropriate units of measure. All drawings and technical data shall be in SI (metric) units for projects designed in SI units. Preprinted literature in other units shall be accompanied by documentation to show conformance to project requirements.

44.1.4. Transmit all required submittals for a technical specification section at the same time unless prior written waiver of this requirement has been provided by the COTR.

44.1.5. Transmit submittals to the COTR in a logical and orderly sequence in accordance with the Submittal Schedule to prevent project delays or adversely impact work by the Smithsonian Institution or other contractors.

44.1.6. Correct and resubmit submittals according to response from Smithsonian Office of Planning Design & Construction.

44.1.7. Commence work on items requiring submittals only after all related submittals are reviewed and approved by the Smithsonian. All Work shall conform to approved submittals.

44.2. Submittal Schedule and Control Log: The Contractor shall submit, to the COTR, a schedule of work-related submittals using the Smithsonian SF Submittal Log form within *fourteen (14) calendar days after the effective date of the Notice to Proceed. (An electronic Submittal Log form is available upon request.) Submittals shall be listed in the order they are scheduled to be submitted and the following information shall be given:

44.2.1. Project Name, Project Number, Contractor Name, Contract Number.

44.2.2. Technical Specification Section for each submittal.

44.2.3. Unique Submittal Number.

44.2.4. Description of item to be submitted, as listed in the specifications.

44.2.5. Date item must be submitted to the Smithsonian in order to support the project schedule.

44.2.6. Subcontractor providing submittal (in "Comments" column).

44.3. Quantities for Submittals: Unless otherwise noted in the technical specification, the Contractor shall deliver to the COTR:

44.3.1. Shop Drawings: Submit electronic copy of shop drawings in PDF format. Submittal will be forwarded electronically to the AE for review. After submittal review, submittal will be returned to the Contractor electronically, in PDF format. Submit in DWG format, if requested. Submit two reproducible black line prints, if requested.

44.3.2. Product Data, Test Reports, Color Charts, etc. The Contractor will make electronic submittals in PDF format, except for Color Charts. Submit two (2) original Color Charts from each product representative to be retained by the Smithsonian; copies or printouts from the computer will not be accepted. After submittal review, submittal will be returned to the Contractor electronically, in PDF format.

44.3.3. Color/Texture Samples: Submit two (2) samples, minimum size 600 mm by 600 mm, unless otherwise specified. After submittal review, the Smithsonian may retain one (1) sample.

44.3.4. Mock-up and Sample Installations: Unless otherwise specified, minimum size shall be as noted to complete a panel section or normal break in the work.

44.3.5. Written Text Documents, Plans and Reports: Submit electronic copy of written text documents, plans, and reports in PDF format. Submittal will be forwarded electronically to the AE for review. After submittal review, submittal will be returned to the Contractor electronically, in PDF format.

44.4. Submittal Reviews by the Smithsonian: Reviewed submittals will be marked "Approved," "Approved as Noted," "Resubmit" or "Disapproved." Submittal approval by the Smithsonian shall not relieve the Contractor of responsibility for submittal errors, omissions, or deviations from the contract documents. Approval of submissions does not constitute acceptance of substitutions except as covered under sub-paragraph entitled "Contract Requests for Substitutions."

44.5. Submittal Review Period: The Contractor shall transmit, to the COTR, all submittals sufficiently in advance of the time necessary for fabrication and installation to allow for review by the Smithsonian and return to the Contractor, including any time needed for correction and resubmission by the Contractor. The expected time required by the Smithsonian for review of initial submission is 14 calendar days. No extension of the Contract Time will be granted for the Contractor's failure to allow sufficient time for review and processing, including resubmission of items that are initially rejected due to improper submission or non-compliance with the Contract Documents.

44.6. Contractor Requests for Substitutions: Contractor requests for items identified by manufacturer, brand name, make, catalog number, etc. in the contract documents shall be submitted to the Contracting Officer for approval prior to contract award, in accordance with the General Conditions. After award of the contract, contractor requests for substitutions may be considered and accepted by the Smithsonian at the discretion of the Contracting Officer.

44.7. Construction Progress Schedule Submittal: The Contractor shall submit a progress schedule within one (1) calendar day from the date of the Notice to Proceed. No work shall start at the site until the progress schedule has been approved by the COTR. The schedule shall provide a weekly breakdown of activity including interaction between trades and be subdivided in accordance with items of work or areas of the job where the work is to take place. The schedule shall also list equipment, special devices, hardware, products, or other items requiring long lead time, when these items are ordered and the projected delivery dates. The last week of the schedule shall reflect final inspection, testing, and the correction of deficiencies.

45. CRITERIA FOR PRODUCT SELECTION

45.1. To the greatest extent possible, subject to the restrictions of the Buy American Act, provide products, materials, or equipment of a singular generic kind from a single source. Where more than one choice of a product or material is available for Contractor's selection, select an option, which is compatible with other products and materials already selected.

45.2. Provide products complete with accessories, trim, finish, safety guards and other devices and details needed for complete installation for intended use and effect.

45.3. Products, which, by nature of their application, are likely to be needed at a later date for maintenance and repair or replacement work, shall be current models for which replacement parts are available.

45.4. Product selection shall be done in accordance with the following requirements:

45.4.1. Standards, Codes and Regulations: Select from among products that follow the project requirements, as well as with construction standards, all applicable codes and regulations and LEED requirements.

45.4.2. Performance Requirements: Provide products that comply with specific performances indicated and are recommended by the manufacturer (in published product literature or by individual certification) for the application indicated.

45.4.3. Prescriptive Requirements: Provide products that have been produced in accordance with prescriptive requirements, using specified ingredients and components and complying with specified requirements for mixing, fabricating, curing, finishing, testing and other operations in the manufacturing process.

45.4.4. Visual Matching: Where matching with an established sample for color, pattern and/or texture, the COTR shall determine whether a proposed product matches the sample.

45.4.5. Avoidance of banned materials: The Contractor will commit to not using the following toxic and hazardous materials:

45.4.5.1. Products containing asbestos, urea formaldehyde, polychlorinated biphenyls (PCBs) and/or chlorinated fluorocarbons.

45.4.5.2. Products containing lead content, including older or flux containing more than 0.2 percent lead; domestic water pipe or pipe fittings containing more than 8 percent lead; and paint containing more than 0.06 percent lead.

46. PHOTOGRAPHIC DOCUMENTATION

RELATED DOCUMENTS

The Contract Documents in their entirety, including the Drawings, Specifications, Construction Contract Clauses, and any other documents issued as part of the Contract, apply to this Section.

1.2 SUMMARY

A. The Contractor shall provide digital photographs of the project site and construction activities throughout the progress of the Work, acceptable to the Smithsonian Institution. The COTR shall determine the vantage points from which photographs will be taken.

1. At least 24 color progress photographs shall be taken monthly. The actual number and location of views shall be directed by the COTR. Photographs shall be taken at the start and finish of various elements of construction designated by the COTR.

47. CONTRACTOR CORRESPONDENCE AND DAILY REPORTS

47.1. The Contractor shall correspond with the COTR for all matters related to this construction project, unless otherwise directed. All correspondence shall be signed and dated by the Contractor and shall reference the project, project number and contract number.

47.2. The Contractor shall maintain daily reports using the Smithsonian Institution Contractor's Daily Report form. Reports shall be numbered consecutively, and all sections shall be completed or noted as "not applicable." Reports shall contain detailed remarks each day, including but not limited to progress on the job, problems discovered and discussions with Smithsonian staff. Reports shall be submitted to the COTR each day for the previous workday.

SECTION I - SAFETY, HEALTH, AND FIRE PROTECTION

48. JOB SITE SAFETY

48.1. Safety Coordinator: The Contractor shall designate a person responsible and accountable for personnel safety at both corporate and project level at the project site for the duration of the project. Contracts specifically requiring safety or industrial hygiene personnel shall include a copy of their resumes. Qualifications for the Safety Coordinator shall include the OSHA 30-hour course or equivalent course.

48.2. Job Site Safety Plan: The Contractor shall submit a Jobsite Safety Plan at least 15 calendar days prior to mobilization to the site for approval by the COTR. As a minimum, the plan shall detail the procedures, designated persons, instructions, and reports to be used to assure jobsite safety for all contractors, subcontractors, Smithsonian personnel, the public and others on the site.

48.2.1. Site Specific Safety Plan: Upon award of this contract, the contractor shall provide a Site-Specific Safety Plan (SSSP). The SSSP is a safety and health policy and program document and outlines how the contractor will safely conduct their work. This plan shall be job-specific and shall also address any unusual or unique aspects of the project or activity for which it is written. The SSSP shall interface with the employer's overall safety and health program, and a copy shall be available on the work site. Any portions of the employer's overall safety and health program that is referenced in the SSSP shall be included as appropriate. The plan shall include but not limited to the following:

a. Signature Sheet that must include plan concurrence (e.g., Chief of Operations, Corporate Chief of Safety, Corporate Industrial Hygienist, project manager or superintendent, project safety professional, project QC). Provide concurrence of other applicable corporate and project personnel (Contractor).
b. Background Information that must include Brief project description, description of work to be performed, and location; phases of work anticipated these will require a Job Hazard Analysis (JHA's). OSHA 3071
c. Statement of Safety and Health Policy
d. Responsibilities and lines of Authority
e. Subcontractors and Suppliers
f. Training
g. Safety and Health inspections that include assignment of responsibilities for a minimum daily/weekly job site safety and health inspection during periods of work activity level of technical proficiency needed to perform the inspections, proof of inspector's training/ qualifications.
h. Accident Reporting
i. Plans (programs, procedures) required by the Safety Manual. Based on a risk assessment of contracted activities and on mandatory OSHA compliance programs, the Contractor shall address all applicable occupational risks and compliance plans. Using the 29 CFR 1926 and/or current and accepted procedures in the EM 385-1-1 as a guide.
j. Risk Management Processes Detailed project-specific hazards and controls shall be provided by a Job Hazard Analysis (JHA) for each major phase/activity of work, including but not limited to work involving confined space, fall protection, trenching/excavation, crane/rigging, steel erection, hot work, protection of the public, scaffolding, and other activities that involve high risk potential.
k. Jobsite supervisor/superintendent shall sign safety plan and JHA submissions with a final approved copies kept on the jobsite for operational references.
l. Project Evaluation for OSHA's silica standard (29 CFR 1926.1153) focuses on reducing exposure to respirable crystalline silica 12.
    Key requirements include:
        i. Lowering the permissible exposure limit (PEL) from 250 ug/m3 TWA to 50 ug/m3 TWA.
        ii. Implementing engineering controls, respiratory protection, a written plan, proper training, ongoing medical surveillance, and oversight by a competent person.

48.3. Occupational Safety and Health: This contract is subject to Title 29 of the Code of Federal Regulations, Part 1910 "Occupational Safety and Health Standards" and Part 1926 "Safety and Health Regulations for Construction" pursuant to the Occupational Safety and Health Act (OSHA) of 1970 administered by the US Department of Labor, Occupational Safety and Health Administration.

48.4. Emergency Assistance: The Contractor shall post, at the site, telephone numbers for reporting emergencies, including the NZP's Police Station, ambulance, police, fire department, gas utility, electric utility, water/sewer utility, poison prevention aid and hazardous-waste handling. This information shall be posted in a conspicuous location within the project area prior to the start of any work at the site.

48.5. Safety Signs: The Contractor shall post legible accident prevention signs in construction areas in accordance with OSHA standards. Safety signs shall conform to ANSI 235.1 and 235.2 Vehicular traffic control devices, barricades and signals shall conform to ANSI D6.1.

48.6. Report of Accident or Illness: In the event of any accident or illness for which medical assistance is required, any criminal action or any fire, the Contractor shall notify the appropriate authority (Ambulance, Police, and Fire Dept.), Smithsonian Security, NZP Police, and the COTR.

48.7. Emergency Evacuation: The Contractor shall post evacuation routes and facility emergency/self-protection plans at the site, train all employees in emergency procedures, and document such training. In the event of a fire, the Contractor shall immediately activate the alarm at the nearest fire alarm pull station and notify NZP Police. Upon the activation of the audible alarm, the building will be evacuated. No personnel shall reenter the facility until security personnel signal that the building is safe.

48.8. Contractor Personnel to be Contacted: The Contractor shall submit a written list of emergency telephone numbers and names of persons to contact for the General Contractor superintendent and for each major sub-contractor working on the project site. The initial list shall be submitted to the COTR at the Preconstruction Meeting. The list shall be updated and resubmitted to the COTR as needed.

49. TOXIC AND HAZARDOUS SUBSTANCES

49.1. The Contractor shall submit to the COTR for approval, at least ten (10) working days prior to their intended use, a written list of toxic and hazardous substances that will be used on the project. The Contractor shall submit a "Material Safety Data Sheet" similar to OSHA Form No. 20 for these substances to identify the following information:

49.1.1. Product Identification.

49.1.2. Hazardous Ingredients.

49.1.3. Physical Data.

49.1.4. Fire and Explosion Hazard Data.

49.1.5. Health Hazard Data.

49.1.6. Emergency and First Aid Procedures.

49.1.7. Reactivity Data.

49.1.8. Spill or Leak Procedures.

49.1.9. Special Protection Information.

49.1.10. Special Precautions.

49.1.11. Volatile Organic Compound (VOC) Content.

49.2. The Contractor will commit to not using the following toxic and hazardous materials:

49.2.1. Products containing asbestos, urea formaldehyde, polychlorinated biphenyls (PCBs) and/or chlorinated fluorocarbons.

49.2.2. Products containing lead content, including solder or flux containing more than 0.2% lead; domestic water pipe or pipe fittings containing more than 8% lead and paint containing more than 0.06% lead.

49.2.3. Chlorofluorocarbon (CFC)-based refrigerants in new base building heating, ventilating, air conditioning and refrigeration (HVAC&R) systems and comprehensive CFC phase-outs when reusing existing base building HVAC equipment.

49.2.4. The Contractor hereby understands that historic properties may contain pre-existing harmful materials and coatings including, but not limited to, arsenic, lead, dioxide, polyvinylchloride (PVC) and asbestos. Upon discovery of hazardous or toxic materials, the Contractor shall alert the COTR immediately.

49.3 The Contractor shall monitor the use of all toxic and hazardous substances to ensure that exposure to their workers from airborne concentration of, or physical contact with, these substances does not exceed applicable regulatory worker health and safety exposure limits.

49.4. The Contractor shall monitor the use of all toxic and hazardous substances to ensure that exposure to Smithsonian Institution and NZP employees and visitors to airborne concentrations of, or physical contact with, these substances is maintained as low as reasonably achievable. Any equipment or technical measures for this purpose must first be approved by the NZP's Safety Office through the COTR. Under no circumstances shall exposure exceed the established Short-Term Exposure Limit or 50% of the established Threshold Limit Values or Permissible Exposure Limits (whichever is less) as specified in either:

49.4.1. "Threshold Limit Values and Biological Exposure Indices" of the American Conference of Governmental Industrial Hygienists, latest revision, or

49.4.2. Title 29 CFR Part 1910, Subpart Z - "Toxic and Hazardous Substances" of the Occupational Safety and Health Standards, latest revision.

49.5. Exposure of the NZP's animals to air-borne or any other physical contact with any toxic or hazardous substance will be prohibited.

49.6. All toxic and hazardous substances and materials used by the Contractor must be removed from the NZP property upon completion of the project.

49.7. The Contractor shall provide methods, means and facilities to prevent contamination of soil, water, and atmosphere from discharge of noxious, toxic substances and pollutants produced by construction operations. The removal of contaminated waste shall follow applicable laws and regulations.

49.8. To achieve compliance with the requirements of this section, administration or engineering controls shall first 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 exposure of all persons within the prescribed limits. Descriptions of equipment or technical measures to be used for this purpose must be submitted to the COTR for approval. The Contractor's requirements for compliance with all applicable Local, Federal, and State regulations remain in force.

49.9. The SI may reject any product that poses a high risk of fire or health hazard to staff, visitors, or the building, based on flammability criteria (e.g., low flashpoint) or established toxicity data (e.g., designation as a human carcinogen).

49.10. The Contractor shall submit, to the COTR, a list of the hazardous materials to be stored on site and the manner in which they will be stored. All containers and storage cabinets shall be approved by the COTR and labeled as to hazard and content.

49.11. The SI has made every effort to identify and to notify the Contractor of hazardous materials that may be encountered during the work. However, if suspected asbestos-containing material, lead-based paint, or other suspected hazardous materials are encountered during demolition or other phases of the work, the work involving the suspected material shall cease and the Contractor shall notify the COTR immediately.

50. PERSONAL PROTECTIVE EQUIPMENT

50.1. Personal protective equipment for eyes, face, ears, nose, head, extremities and/or full body shall be provided, used, and properly maintained by the Contractor whenever necessitated by reasons of hazards encountered in a manner capable of causing illness, injury, or impairment in the function of any part of the body.

50.2. Persons required to use personal protective equipment shall be thoroughly trained. Training programs shall, as a minimum, meet OSHA and EPA requirements where applicable. The Contractor shall submit proof and criteria for employee training as requested.

51. BARRICADES, BARRIERS, AND WALKWAYS

51.1. The Contractor shall provide safety barricades in accordance with the District of Columbia Building Code and applicable OSHA regulations. The Contractor shall also provide barricades, subject to approval by the COTR, to deter passage of persons and/or vehicles into construction areas as specified or necessary.

51.2. The Contractor shall install temporary barriers, in a manner satisfactory to the COTR, to contain and secure the site from unauthorized entry and to minimize the adverse effects of noise, dust and vapors generated by construction activities on surrounding areas. Barriers shall be constructed of pressure-impregnated fire-retardant treated wood, with fire-retardant 6-mil polyethylene, as necessary. Submit all product data to the COTR for review and approval.

51.3. If the work interferes with public or employee access to the facility or parts of the facility, as determined by the COTR, the Contractor shall provide personnel barriers and signage to create easily identifiable, accessible (to people with disabilities) walkways around the work. Signs shall be posted at decision points to prevent unnecessary travel along changed routes and to dead ends. The barriers shall be erected and dismantled in phases so that a clear route is always available. The COTR and Contractor personnel shall have access through the barriers to the work areas. The Contractor may use hardware on the barrier doors to prevent entry by unauthorized persons.

51.3.1. Interior barriers shall be of standard drywall partition construction, painted and terminated at the underside of the existing ceilings. All requirements for fire protection shall be maintained.

51.3.2. Exterior barriers shall be of dimensional lumber and plywood, painted on both sides and supported to prevent overturning. Barriers shall be repainted and maintained as necessary to remain in good condition as long as they are required.

51.4. Unless specifically indicated otherwise, barricades, barriers and associated signs shall be removed upon completion of the Work. The Contractor shall coordinate the dismantling and removal with the COTR.

52. EXISTING FIRE PROTECTION SYSTEMS

52.1. During the course of the Work, all existing smoke and heat detectors and sprinkler heads must remain operable. Coverings may be applied to protect them from spray coatings or other hazardous conditions only during the actual operations. Coverings must be removed immediately after the operations have concluded. Damaged detectors and sprinkler heads shall be replaced immediately by the Contractor at no additional cost to the Smithsonian Institution. The Contractor shall test replaced detectors and sprinklers after installation to the satisfaction of the COTR.

SECTION J – SECURITY REQUIREMENTS

53. GENERAL SECURITY REQUIREMENTS

53.1 The Contractor and his/her employees must comply with security requirements imposed by the National Zoological Park, including any necessary security clearances. Failure to inspect the site or obtain knowledge of security regulations shall not relieve the Contractor from security requirements or from performance of any part of the work.

53.2. Fourteen (14) days prior to the start of work on the site, the Contractor, after receiving the Notice to Proceed, shall submit to the COTR for approval, a list of the names and addresses of all employees and subcontractor employees who will be working on the site. The list shall identify the Prime Contractor and each subcontractor and trade. It shall be updated as necessary to accurately identify all workers who will be working on the site during the project.

53.3. Provide at the Preconstruction Meeting the name and telephone number of the Contractor's Superintendent and authorized alternate individual who can be reached on a 24-hour basis.

53.4. Notify the COTR prior to disturbing any alarm wiring, devices, systems, etc. Planned disturbances will be coordinated at least three (3) working days in advance of when the work is scheduled. Any alarm wiring, devices or systems that are disturbed for any reason must be reported to the COTR within five (5) minutes of the occurrence. The COTR will determine the procedures for repairing the damage and who will perform the repair work. The Contractor will bear the cost of such repairs.

53.5 The contractor shall provide adequate security to prevent the presence of unauthorized persons on the work site area, and to keep doors secured when not in actual use to ensure the integrity of the barrier as well as for the property security.

53.6. The Contractor is prohibited from hunting, collecting, or feeding animals on Smithsonian property.

53.7. The Contractor is prohibited from feeding, petting, or harassing any NZP animal(s).

54. IDENTIFICATION BADGES

54.1 Key personnel may apply for an SI issued security badge with COTR’s approval.

55. SECURITY OF TEMPORARY OPENINGS

55.1. Any temporary opening in the building perimeter or between non-public and public interior spaces must be closed and secured with means acceptable to the COTR at the end of each workday. A clear and safe path shall be maintained at all times to allow visitors entrance into the National Zoological Park and its buildings. The Contractor shall secure his facilities and equipment during non-working times at his own expense. Authorized Smithsonian personnel shall have access to the work site.

56. EXISTING BUILDING ALARM SYSTEMS

56.1 Contractor and COTR shall review work plans prior to starting work to identify alarms and notifications that will be impacted by the scheduled work.

56.2 COTR shall approve all modifications and adjustments to inactivate notifications.

57. NZP POLICE OFFICER DUTY CHARGES

57.1. If the Contractor is required to accelerate the work in order to complete the project within the specified Contract Time or if other conditions arise as a result of the Contractor's management of the work, which require that construction be accomplished during other than the normal workdays and hours defined for this project, the Contractor will be required to assume the cost of any additional inspection and NZP police officer at overtime rates.

SECTION K - SCHEDULES AND PAYMENTS

58. SCHEDULE OF VALUES

58.1. The Contractor shall submit, to the COTR, a schedule of estimated values of all parts of the work. The breakdown of costs on the Schedule of Values shall follow the divisions used in the project specifications and shall reflect major items and groups of items shown on the Contractor's project schedule. All values shall be in US dollars.

58.2. Wages: The contractor shall verify wages and comply with regulated wage scales, i.e., Davis-Bacon, Service Contract Act, etc.

59. SCHEDULING & PAYMENTS / CRITICAL PATH METHOD

59.1. CPM Scheduling: The work under this project will be scheduled and reported by the Contractor using the Critical Path Method. Submit Project Schedule in both PDF format and original scheduling software format. The approved Project Schedule(s) shall be used by the Contractor for planning, organizing, executing, and directing the work; for monitoring and reporting progress; and for requesting payment for work completed. All costs shall be identified in US dollars.

59.1.1. Order and Inter-Dependence of Activities: The Critical Path Method will be followed to show the order and interdependence of activities and the sequence in which the work is to be accomplished. Each activity shall be tied to all activities that must logically precede or follow it and all paths shall be continuous through to completion date(s).

59.1.2. Work Breakdown Parameters for Activities: The activities shown on the network diagram shall include construction activities, submittal processing by the Contractor, submittal processing by the Smithsonian, procurement activities for major equipment, fabrication of special materials and equipment, installation of special materials and equipment, inspections, and tests. All field activities that affect progress toward contractually required dates for completion of all or parts of the Work shall be shown. The level of detail shall be such that the duration of any activity will be no longer than ten (10) working days and no activity will have a dollar value exceeding $30,000, except as allowed by prior and specific approval of the COTR. All aspects of the contract activities are to be identified and priced accordingly in the proposal. This is to include, but shall not be limited to, separate pricing for bonds, insurance, CQC related work, etc. As-built drawings and all closeout requirements shall be line item priced.

59.1.3. Cost-loading of Activities: The Project Schedule shall include a dollar value (cost) for each work activity. The cost shall include labor, materials, equipment, small tools, incidentals and a prorated portion of overhead and profit. The sum of all activity costs shall be equal to the total Contract Price. Each activity cost shall be coded with a cost code corresponding to a line item on the Schedule of Values.

59.1.4. Computer Software: The Contractor shall use a computerized CPM scheduling software designed for use on MS computers. The name of the software proposed for use shall be submitted to the COTR, along with literature about the program's capabilities, functions, and operations, demonstrating that the requirements of the entire section entitled "Scheduling of the Work / Critical Path Method" can be met.

59.2. Required Schedules: The Contractor shall prepare and submit a Preliminary Project Schedule, Complete Project Schedule, Condensed Summary Schedule, Progress Schedules, and Recovery Schedules as described below.

59.2.1. Complete Project Schedule: Within 14 calendar days after receipt of Notice to Proceed, the Complete Project Schedule shall be submitted to the COTR for review and approval. The Contractor's submission of the Preliminary Project Schedule shall include one (1) hard along with a PDF and Native File Copy.

59.2.2. Condensed Summary Schedule: Along with each copy of the Complete Project Schedule, the Contractor shall submit to the COTR for approval, a condensed summary version consisting of not more than 250 activities summarizing major work elements.

59.2.3. Progress Schedules: Each month, the Contractor shall prepare a Progress Schedule by inputting all information regarding actual start and actual finish dates, projected through the end of the month, into the computerized Project Schedule. Complete discussion of this requirement is contained in the section "Reporting Progress and Applying for Payment."

59.2.4. Recovery Schedule: If the work falls substantially behind the approved Project Schedule the COTR may require the Contractor to submit a Recovery Schedule in accordance with the Construction Contract Clauses paragraphs relating to "Commencement, Prosecution and Completion of Work." Upon request, the Contractor shall submit a Recovery Schedule to the COTR for approval within ten (10) working days. The requirements set forth herein in the sub-paragraph entitled "Complete Project Schedule," shall apply to all activities shown on the Recovery Schedule.

59.3. Changes Related to Requests for Proposals: For all proposals involving requests for time extensions or other significant changes to schedule, the Contractor shall submit a listing of all the activities affected, added, or deleted (by node numbers). The effect in time and money shall be described for each activity. If, in the opinion of the COTR, the proposed change may impact the completion date(s), the Contractor shall submit a diagram of that portion of the network schedule affected by the changes, along with standard reports for analysis.

59.3.1 Diagrams and reports submitted to illustrate the impact of a proposed change shall show the necessary revisions to activities, along with their costs, durations, and trade responsibilities. Failure to submit such a diagram with a proposal shall constitute a waiver of any claims for time extensions associated with the subject of that proposal.

59.3.2 Modification of activity times shall be agreed to by both the Contractor and the COTR. In the event that agreement on modified activity times cannot be reached, the COTR will direct the specific time adjustments to be entered into the program to determine approved, revised, contract completion dates.

59.4. Response to Application:

59.4.1. Payment shall be made only for progress agreed upon by the COTR, performed on original Contract Work or approved modifications, in accordance with the current, approved Project Schedule. Failure to submit the Application in accordance with the specifications will prevent the processing of payments.

59.4.2. Payments will be mailed to the Contractor's address as identified in the contract documents on record with the Contracting Officer. Any changes of address or requests for wire transfer of progress payments must be made in writing, signed by the Contractor's authorized person, and submitted to the Contracting Officer.

60. ASSIGNMENT OF CLAIMS

60.1. Assignment of Claims are subject to the approval of the Contracting Officer. Any Assignment of Claim or subsequent re-assignment shall meet the requirements of the General Conditions contract clause entitled "FAR 52.232-23 Assignment of Claims."

60.2. All documents for assignments shall be written in the English language and shall be original ink signatures of the Contractor and assignee. All monies shall be identified in US dollars.

SECTION L - PROJECT CLOSEOUT REQUIREMENTS

61. PROJECT CLOSEOUT

61.1. Definition: Project closeout is a scheduled process for fulfillment of remaining contract requirements at the end of the project in preparation for final acceptance, final payment, and normal termination of contract, beneficial occupancy, and establishment of the warranty period.

62. SUBSTANTIAL COMPLETION

62.1. Definition: The date of Substantial Completion of a project or specified part of a project is the date, as confirmed by inspection by the COTR, when the construction is at least 95% complete and ready for beneficial occupancy, so that the Smithsonian can take possession of that area or part of the work. Portions of the work that are specified to be phased for completion, areas required for Smithsonian's use prior to completion of the total project or items of work identified by the COTR as necessary for partial beneficial occupancy may be inspected for substantial completion separately from the rest of the Work.

62.1.1. The Smithsonian Institution reserves the right to occupy or install equipment in completed areas of the building prior to substantial completion provided that such occupancy does not interfere with the completion of the work. Such partial occupancy shall not constitute acceptance of any part of the work.

62.2. Request for Substantial Completion Inspection: The Contractor shall submit a written request to the COTR for an inspection to establish Substantial Completion status. This request shall specify areas or parts of the work to be considered and shall include a listing of all exceptions to the request, that is, items not considered to be substantially complete.

62.3. Submission of Operation and Maintenance Manuals: Prior to requesting Substantial Completion Inspection, the Contractor shall submit, to the COTR, three (3) sets of manuals for all systems and equipment, as specified in the technical sections of this specification. The manuals shall be bound in letter-sized, three-ring, loose-leaf binders with durable plastic covers. They shall be organized into suitable volumes of manageable size using the divisions of the Specifications as a guide. Each manual shall have a table of contents and shall be assembled to conform to the table of contents with tab sheets locating each subject. The instructions shall be legible and easy to read. Where oversize drawings are necessary, they shall be folded to be not greater than letter-size. The words "Operation and Maintenance Manual," the name and location of the project, project number, contract number, date, and the name of the general contractor, shall appear on the cover. Data shall be specific to the equipment that is installed and reflect all approved changes and substitutions. Data shall also reflect any required or recommended seasonal adjustments or inspections. Include electronic copy of manual, in PDF format, on a thumb drive. Manuals shall include, as a minimum, the following data:

62.3.1. Detailed description of each system and each of its components, including layout showing piping, valves, controls, and other components and including diagrams and illustrations where applicable.

62.3.2. Wiring and control diagrams with data to explain detailed operation and control of each component.

62.3.3. Control sequence describing start-up, operation and shut down.

62.3.4. Procedures for starting, operating, and shut down.

62.3.5. Installation instructions.

62.3.6. Maintenance and overhaul instructions.

62.3.7. Lubricating schedule, including type, grade, temperature range and frequency.

62.3.8. Emergency instructions and safety precautions.

62.3.9. On-site acceptance test results for equipment installed under this contract.

62.3.10. Approved product data, shop drawings and system as-builts.

62.3.11. Copies of approved certifications and laboratory test reports (where applicable).

62.3.12. Notarized copies of warranties (originals to be provided as required by "Warranties and Guarantees").

62.3.13. Written instructions for test procedures.

62.3.14. Performance curves and rating data.

62.3.15. Parts list, including source of supply, recommended spare parts and service organization convenient to Smithsonian.

62.3.16. Name, address, and telephone number of each subcontractor who installed equipment and systems, local representative for each type of equipment and each system.

62.3.17. Other pertinent data applicable to the operation and maintenance of particular systems or equipment and/or other data as specified Divisions 2 through 16 of the Specifications.

62.4. Other Prerequisites for Substantial Completion Inspection: The Contractor shall also complete the following prior to requesting inspection for certification of substantial completion:

62.4.1. Testing and start-up of systems.

62.4.2. Installation of all signage, including accessibility related signs, equipment instructions, identification labels and permanent directional signs.

62.4.3. Submission of spare parts, tools and surplus materials as required in technical specifications. Submit to the COTR an MSDS for each surplus material that contains toxic or hazardous substances. Surplus materials that the SI determines not to retain shall be removed and properly disposed of by the Contractor according to all applicable regulations.

62.4.4. Scheduling of training sessions for Smithsonian personnel.

62.4.5. Removal of all waste, rubbish and temporary facilities and services. Means of access to all areas of the work to be inspected by the COTR shall be maintained.

62.4.6. Disposition of samples and mock-ups not incorporated into the work.

62.4.7. Arrangement for permanent utility connections and billing responsibility transfer to Smithsonian's Office of Facilities Management and Reliability (OFMR).

62.4.8. Arrangement for transfer of security responsibility for the project site and changeover of locks by Smithsonian's Office of Protection Services (OPS).

62.4.9. Hazardous Waste Disposal: Submit copies to the COTR of the following hazardous waste records for hazardous waste generated on SI property and disposed of by contract personnel.

1. Hazardous Waste Manifests
2. Notification and Certification Forms
3. Material Profile Sheet or characterization
4. Container Content Sheets
5. Certificates of Disposal

62.5. Scheduling of the Substantial Completion Inspection: Within seven (7) calendar days after receipt of the Contractor's written request, the COTR will either schedule an inspection or advise the Contractor of work that must be completed or prerequisites that must be met prior to scheduling the Substantial Completion Inspection. In that case, another written request for Substantial Completion Inspection must be submitted when all requirements have been met.

62.6. The Substantial Completion Inspection: The Substantial Completion Inspection will be performed by representatives of the Smithsonian Institution led by the COTR. During the inspection, the COTR will prepare a punch list of deficiencies in the work. If the punch list becomes too extensive the COTR may cancel the inspection and require additional work to be performed for a repeat inspection.

62.6.1. For satisfactory inspection results, the COTR will issue the written punch list to the Contractor as soon as possible after the inspection. Items on the punch list must be completed prior to final acceptance of the total project work.

62.6.2. For unsatisfactory inspection results, the COTR will, within three (3) calendar days, give written notice to the Contractor that the Work or portion of the Work is not substantially complete in accordance with the contract documents and therefore does not meet Substantial Completion status. Requests for re-inspection shall meet all requirements for the original request for Substantial Completion inspection.

62.7. Punch List: Incomplete contract requirements identified during the Substantial Completion Inspection will form an initial basis for a punch list for final acceptance. The Contractor within the Contract Time must complete all punch list items. If additional days are needed to complete the punch list items beyond the Contract Time, then the Contractor shall submit, prior to the end of the Contract Time, a written request to the Contracting Officer stating:

64.7.1. Items requiring additional time.

64.7.2. Amount of time needed to complete each item.

64.7.3. Reasons why the items cannot be completed by the contract completion date.

63. FINAL COMPLETION AND ACCEPTANCE

63.1. Definition: The date of final completion of a project is the date, as confirmed by inspection by the COTR, when the Work is satisfactorily completed and accepted in accordance with the contract documents, as amended and/or modified.

63.2. Request for Final Completion Inspection: When all items on the punch list have been corrected to the satisfaction of the COTR and additional requirements as described below have been satisfied, the Contractor shall submit a written request for Final Completion Inspection.

63.3. Prerequisites for Final Completion: Prior to requesting the inspection for certification of Final Completion, the Contractor shall complete the following:

63.3.1. Submission of a copy of a prior punch-list stating that each item has been completed or otherwise resolved for acceptance.

63.3.2. Provision of Instructions to Smithsonian Personnel -where instructions to Smithsonian personnel are specified in other sections, furnish, without additional expense to the Smithsonian, the services of competent instructors, who will give full instruction in the care, adjustment and operation of the systems and equipment to designated Smithsonian employees.

1. Each instructor shall be familiar with all parts of the system on which he or she is to give instruction and shall be knowledgeable about the systems' operation and required maintenance. Factory trained instructors shall be employed wherever practical and available.

2. Unless otherwise required or approved, the instruction shall be given during the regular work week after the equipment has been accepted and turned over to the Smithsonian for regular operation. Where significant changes or modifications in equipment are made under the terms of the contract, additional instruction shall be provided as may be necessary to acquaint the operating personnel of the changes or modifications. Unless otherwise stated, at least half of the time allocated for instruction shall be "hands-on," using the actual system installed.

3. Upon completion the Contractor shall obtain written acknowledgment from the COTR that the required instruction was completed.

63.3.3. Posting of operating instructions approved by the COTR for each system and each principal piece of equipment. Include wiring and control diagrams showing the complete layout of the entire system including equipment, piping, valves, and control sequence framed under clear laminated plastic and posted where directed by the COTR. Printed or engraved operating instructions for each principal piece of equipment including start-up, proper adjustment, operating lubrication, shut-down safety precautions, procedure in the event of equipment failure and any other necessary items of instruction as recommended by the manufacturer of the unit shall be attached to or posted adjacent to the piece of equipment. Operating instructions exposed to the weather or wet or humid conditions shall be made of weather-resisting materials or shall be suitably framed and enclosed to be weather protected. Operating instructions shall not fade when exposed to sunlight and shall be secured to prevent easy removal or peeling. The Contractor shall coordinate the location of posted instructions with the COTR.

63.3.4. Provision of equipment demonstrations for each equipment item. The Contractor shall coordinate scheduling of all demonstrations through the COTR.

63.3.5. Submission of original warranties for all products, equipment, and systems.

1. The Contractor shall assemble original warranty certificates or notarized copies of warranty certificates executed by the Contractor, Subcontractors, suppliers, and manufacturers in a tab-indexed, three-ring loose-leaf binder with a durable plastic cover. Provide electronic copy, in PDF format, on CD. The table of contents shall identify the item covered, the location of the item, the date of Substantial Completion, expiration date of the warranty and the supplier, vendor and installing contractor. Duplicate notarized copies of warranties shall be provided as required by "Manuals for Operation, Maintenance and As-Built Product Data."

2. Each warranty certificate or bond shall identify the date(s) for:

(1) Substantial Completion status in accordance with project closeout requirements.

(2) Beginning and ending of the warranty period.

(3) The Contractor shall provide any coincidental product warranty, which is available on a product incorporated in the Work, but for which the warranty is not specifically required by the contract documents.

3. Warranty of Construction: The Contractor shall warrant that the work performed under this contract conforms to the contract requirements and is free of any defect in equipment, materials, design furnished, or workmanship performed by the Contractor or any subcontractor or supplier at any tier. Unless otherwise stated in the technical sections of the Specifications, the warranty of the Work shall continue for a period of one (1) year from the date of Final Completion status. If the Smithsonian takes partial occupancy before Final Completion, then the warranty for that portion shall be in effect for a period of one (1) year beginning on the date of Substantial Completion for that portion of the Work.

4. Response Time for Warrantee Items – For all items under the warrantee period that are deemed by the COTR as essential to the 24/7 operations of the facility, the contractor will provide (at no additional cost to SI) emergency response and corrective actions as required (less than 4 hours). Provide 24/7 contact personal.

63.3.6. Submission of construction progress photographs and negatives, property survey and similar final record information.

63.3.7. Arrangement for change-over locks through the COTR and Smithsonian Office of Protection Services as required for security for Smithsonian occupancy.

63.3.8. Submission of evidence of payment and transfer date of utility company accounts for those utilities previously billed to the Contractor during construction, as necessary.

63.3.9. Submission of evidence that all regulatory agency permits, and code requirements have been completed and recorded, as necessary.

63.3.10. Submission of a signed, written statement that no damage has occurred to the site as documented by the pre-condition survey report.

63.3.11. Final clean up, including:

1. Sweep and dust all surfaces and wash all finished surfaces to appear new and free of all stains, soil marks, dirt, and other forms of defacement.

2. Remove labels that are not required as permanent labels.

3. Clean transparent materials, including mirrors and window/door glass, to a polished condition, removing substances that are noticeable as vision-obscuring materials. Replace broken glass and damaged transparent materials.

4. Clean exposed exterior and interior hard-surfaced finishes to a dirt-free condition, free of dust stains, films, and similar noticeable substances. Except as otherwise indicated, avoid disturbance of natural weathering of exterior surfaces. Restore reflective surfaces to original reflective condition.

5. Wipe surfaces of equipment clean. Remove excess lubrication and other substances.

6. Remove debris and surface dust from limited-access spaces including roofs, plenums, shafts, trenches, equipment vaults, utility access holes, attics, and similar spaces.

7. Wet-mop concrete and clean other hard-surface floors according to manufacturers' recommendations.

8. Vacuum clean carpeted surfaces and similar soft surfaces.

9. Clean plumbing fixtures to a sanitary condition, free of stains including those resulting from water exposure.

10. Clean project site (yard and grounds) of litter and foreign substances. Sweep exterior paved areas to a broom-clean condition; remove stains, petro-chemical spills, and other foreign deposits. Rake grounds, which are neither planted nor paved, to a smooth, even textured surface.

63.4. Inspection of the Work for Final Completion: Upon receipt of the Contractor's written notice that the work has been completed, the COTR will inspect the work to confirm Final Completion status and acceptance of the work. As soon as possible after inspection, the COTR will either provide written acknowledgment of final acceptance or advise the Contractor of work not completed or obligations not fulfilled as required for final completion and acceptance.

63.5. Application for Final Payment:

63.5.1. Application for Final Payment shall be submitted only after Final Acceptance has been certified in writing to the Contractor by the COTR. Application shall include final labor data and progress schedule update.

63.5.2. Final Payment will be approved when Final Acceptance has been certified and the following conditions have been met:

1. Certification signed and submitted by the Contractor that all contract requirements, including contract modifications, have been met.

2. Final Release of Claims submitted.

3. Release of assignment of claims or consent of surety submitted, as necessary.

4. All security ID badges, and parking permits returned to Smithsonian.

5. As-Built Record Drawings Submitted: During the progress of the work the Contractor shall maintain a complete and up-to-date set of record prints, open to inspection by the COTR at any time. These prints shall provide a complete and accurate as-built record of all changes to the Contract Drawings, including rerouting of runs, relocation of items or control points and all other modifications. The exact location of pipes, conduit, or other features concealed underground, under concrete, in chases or above ceilings shall be shown by perpendicular dimensions from at least two available landmarks. As-built drawings shall be neatly marked with colored pencils or ink, marked "As-Built" and signed and dated by the Contractor. Upon completion of the Work and before final payment, the Contractor shall submit the following to the COTR: photographically produced as-built record drawings sized the same as the contract drawings; electronic copies of as-built record drawings in PDF and DWG formats.

6. As-Built Record Survey of Underground Utilities Submitted: If outside or underground utilities are part of the work, the Contractor shall furnish, to the COTR for approval, an acceptable and accurately dimensioned (GIS) survey showing location and elevation of underground storage tanks, all utility lines for water, gas, electrical, sewer, steam, etc., including valves, connections and changes in direction, as installed under the contract, within the property lines and outside the building walls. Points where utility lines emerge from the building shall be located from lot monuments. The survey shall be made to scale and must be marked "As-Built" and signed and dated by the Contractor. The Contractor shall furnish an electronic copy of as-built record drawings in PDF and DWG formats to the COTR on the same size as the contract drawings.

7. As-Built Record Specifications Submitted: The Contractor shall submit one (1) hard copy and a digital (scanned) set of project

specifications with annotations to identify any changes made during construction, referencing modification numbers, dates and originators of authorizing letters or memos and other sources of changes. The cover shall be marked "As-Built" and signed and dated by the COTR.

Construction and Demolition Waste Tracking Sheet:
To be submitted with each application for payment for the payment period, and at project completion with total waste data and total percentage of waste diverted from landfill for entire project period.

Project Name: _____
Start Date: _____
End Date: _____

Material Description	**Disposal date**	**Diverted from Landfill or incinerator? (Y/N)**	**Diversion method (Recycled, Salvaged, etc.)**	**Hauler or Destination (submit receipts)**	**Volume (in cubic feet)**	**Weight (in tons)**
Land Clearing Debris						
Gypsum Wallboard Scrap						
Cardboard						
Paper goods						
Beverage containers						
Assorted Plastic						
Wood Pallets						
Asphaltic Concrete Paving						
Concrete						
Brick						
CMU						
Lumber						
Plywood and OSB						
Wood Paneling						
Wood Trim						
Miscellaneous Metals						
Structural Steel						
Rough Hardware						
Insulation						
Roofing						
Doors and Frames						
Door Hardware						
Windows						
Non-Window Glass						

Material Description	**Disposal date**	**Diverted from Landfill or incinerator? (Y/N)**	**Diversion method (Recycled, Salvaged, etc.)**	**Hauler or Destination (submit receipts)**	**Volume (in cubic feet)**	**Weight (in tons)**
Glazing						
Acoustical Tile						
Carpet						
Carpet Pad						
Demountable Partitions						
Equipment						
Cabinets						
Plumbing Fixtures						
Piping						
Piping Supports and Hangers						
Valves						
Sprinklers						
Mechanical Equipment						
Electrical Conduit						
Copper Wiring						
Light Fixtures						
Lamps						
Lighting Ballasts						
Electrical Devices						
Switchgear and Panel boards						
Transformers						
Other:						
Other:						
Other:						
				Total Diverted		
				Total Not Diverted		
				Total All Waste = Total Diverted + Total Not Diverted		
				% Diversion Rate* = Total Diverted/Total All Waste		

**Percentage Diversion Rate to be compiled after project completion. Minimum Diversion rate is 50%. Goal Diversion rate is 75%.*

END OF SUPPLEMENTARY CONDITIONS FOR CONSTRUCTION

SECTION 270526.10 - GROUNDING AND BONDING FOR SECURITY SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

B. Section 280500.10 Common Work Results for Electronic Security.

1.2 SUMMARY

A. Section Includes:

1. Grounding conductors
2. Grounding connectors
3. Grounding busbars
4. Grounding rods
5. Grounding labeling

1.3 DEFINITIONS

A. BCT: Bonding conductor for telecommunications.

B. BICSI: Building Industry Consulting Service International

C. TDMM: Telecommunications Distribution Methods Manual

D. TGB: Telecommunications grounding busbar.

E. TIA: Telecommunications Industry Association

F. TMGB: Telecommunications main grounding busbar.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: For Security equipment room signal reference grid. Include plans, elevations, sections, details, and attachments to other work.

1.5 INFORMATIONAL SUBMITTALS

A. As-Built Data: Plans showing as-built locations of grounding and bonding infrastructure, including the following:

1. Ground rods.
2. Ground and roof rings.
3. BCT, TMGB, TGBs, and routing of their bonding conductors.

B. Qualification Data: For Installer, installation supervisor, and field inspector.

C. Field quality-control reports.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For grounding to include in emergency, operation, and maintenance manuals.

1. Result of the ground-resistance test, measured at the point of BCT connection.
2. Result of the bonding-resistance test at each TGB and its nearest grounding electrode.

PART 2 - PRODUCTS

2.1 SYSTEM DESCRIPTION

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Comply with UL 467 for grounding and bonding materials and equipment.

C. Comply with TIA-607-B.

2.2 CONDUCTORS

A. Comply with UL 486A-486B.

B. Insulated Conductors: Stranded copper wire, green or green with yellow stripe insulation, insulated for 600 V, and complying with UL 83.

1. Ground wire for custom-length equipment ground jumpers shall be No. 6 AWG, 19-strand, UL-listed, Type THHN wire.
2. Cable Tray Equipment Grounding Wire: No. 6 AWG.

C. Cable Tray Grounding Jumper:

1. Not smaller than No. 6 AWG and not longer than 12 inches (300 mm). If jumper is a wire, it shall have a crimped grounding lug with two holes and long barrel for two crimps. If jumper is a flexible braid, it shall have a one-hole ferrule. Attach with grounding screw or connector provided by cable tray manufacturer.

D. Bare Copper Conductors:

1. Solid Conductors: ASTM B 3.
2. Stranded Conductors: ASTM B 8.
3. Tinned Conductors: ASTM B 33.
4. Bonding Cable: 28 kcmils (14.2 sq. mm), 14 strands of No. 17 AWG conductor, and 1/4 inch (6.3 mm) in diameter.
5. Bonding Conductor: No. 4 or No. 6 AWG, stranded conductor.
6. Bonding Jumper: Tinned-copper tape, braided conductors terminated with two-hole copper ferrules; 1-5/8 inches (41 mm) wide and 1/16 inch (1.6 mm) thick.

2.3 CONNECTORS

A. Irreversible connectors listed for the purpose. Listed by an NRTL as complying with NFPA 70 for specific types, sizes, and combinations of conductors and other items connected. Comply with UL 486A-486B.

B. Compression Wire Connectors: Crimp-and-compress connectors that bond to the conductor when the connector is compressed around the conductor. Comply with UL 467.

1. Electroplated tinned copper, C and H shaped.

C. Signal Reference Grid Connectors: Combination of compression wire connectors, access floor grounding clamps, bronze U-bolt grounding clamps, and copper split-bolt connectors, designed for the purpose.

D. Busbar Connectors: Cast silicon bronze, solderless compression or exothermic-type, mechanical connector; with a long barrel and two holes spaced on 5/8- or 1-inch (15.8- or 25.4-mm) centers for a two-bolt connection to the busbar.

E. Welded Connectors: Exothermic-welding kits of types recommended by kit manufacturer for materials being joined and installation conditions.

2.4 GROUNDING BUSBARS

A. Manufacturers:

1. Chatsworth Products.
2. Harger.
3. Panduit.

B. TMGB: Predrilled, wall-mounted, rectangular bars of hard-drawn solid copper, 1/4 by 4 inches (6.3 by 100 mm) in cross section, length as indicated on Drawings. The busbar shall be NRTL listed for use as TMGB and shall comply with TIA-607-B.

1. Predrilling shall be with holes for use with lugs specified in this Section.
2. Mounting Hardware: Stand-off brackets that provide a 4 inch (100 mm) clearance to access the rear of the busbar. Brackets and bolts shall be stainless steel.
3. Stand-off insulators for mounting shall be Lexan or PVC. Comply with UL 891 for use in 600-V switchboards, impulse tested at 5000 V.

C. TGB: Predrilled rectangular bars of hard-drawn solid copper, 1/4 by 2 inches (6.3 by 50 mm) in cross section, length as indicated on Drawings. The busbar shall be for wall mounting, shall be NRTL listed as complying with UL 467, and shall comply with TIA-607-B.

1. Predrilling shall be with holes for use with lugs specified in this Section.

2. Mounting Hardware: Stand-off brackets that provide at least a 2 inch (50 mm) clearance to access the rear of the busbar. Brackets and bolts shall be stainless steel.
3. Stand-off insulators for mounting shall be Lexan or PVC. Comply with UL 891 for use in 600-V switchboards, impulse tested at 5000 V.

2.5 GROUND RODS

A. Utilize building ground.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine the ac grounding electrode system and equipment grounding for compliance with requirements for maximum ground-resistance level and other conditions affecting performance of grounding and bonding of the electrical system.

B. Inspect the test results of the ac grounding system measured at the point of BCT connection.

C. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.

D. Proceed with connection of the BCT only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Bonding shall include the ac utility power service entrance, the communications cable entrance, and the grounding electrode system. The bonding of these elements shall form a loop so that each element is connected to at least two others.

B. Comply with NECA 1.

C. Comply with TIA-607-B.

3.3 APPLICATION

A. Conductors: Install stranded conductors for No. 6 AWG and larger unless otherwise indicated.

1. The bonding conductors between the TGB and structural steel of steel-frame buildings shall not be smaller than No. 6 AWG.
2. The bonding conductors between the TMGB and structural steel of steel-frame buildings shall not be smaller than No. 6 AWG.

B. Underground Grounding Conductors: Install bare tinned-copper conductor, No. 2 AWG minimum.

C. Conductor Terminations and Connections:

1. Pipe and Equipment Grounding Conductor Terminations: Bolted connectors.
2. Underground Connections: Welded connectors except at test wells and as otherwise indicated.
3. Connections to Ground Rods at Test Wells: Bolted connectors.
4. Connections to Structural Steel: Welded connectors.

D. Conductor Support:

1. Secure grounding and bonding conductors at intervals of not less than 36 inches (900 mm).

E. Grounding and Bonding Conductors:

1. Install in the straightest and shortest route between the origination and termination point, and no longer than required. The bend radius shall not be smaller than eight times the diameter of the conductor. No one bend may exceed 90 degrees.
2. Install without splices.
3. Support at not more than 36 inch (900 mm) intervals.
4. Install grounding and bonding conductors in 3/4 inch (21 mm) PVC conduit until conduit enters a telecommunications room. The grounding and bonding conductor pathway through a plenum shall be in EMT. Conductors shall not be installed in EMT unless otherwise indicated.

    a. If a grounding and bonding conductor is installed in ferrous metallic conduit, bond the conductor to the conduit using a grounding bushing that complies with requirements in Section 270528.10 "Pathways for Security Systems", and bond both ends of the conduit to a TGB.

3.4 GROUNDING ELECTRODE SYSTEM

A. The BCT between the TMGB and the ac service equipment ground shall not be smaller than No. 1/0 AWG.

3.5 GROUNDING BUSBARS

A. Indicate locations of grounding busbars on Drawings. Install busbars horizontally, on insulated spacers 2 inches (50 mm) minimum from wall, 12 inches (300 mm) above finished floor unless otherwise indicated.

B. Where indicated on both sides of doorways, route bus up to top of door frame, across top of doorway, and down; connect to horizontal bus.

3.6 CONNECTIONS

A. Bond metallic equipment in a Security equipment room to the grounding busbar in that room, using equipment grounding conductors not smaller than No. 6 AWG.

B. Stacking of conductors under a single bolt is not permitted when connecting to busbars.

C. Assemble the wire connector to the conductor, complying with manufacturer's written instructions and as follows:

1. Use crimping tool and the die specific to the connector.
2. Pre-twist the conductor.
3. Apply an antioxidant compound to all bolted and compression connections.

D. Primary Protector: Bond to the TMGB with insulated bonding conductor.

E. Interconnections: Interconnect all TGBs with the TMGB with the telecommunications backbone conductor. If more than one TMGB is installed, interconnect TMGBs using the grounding equalizer conductor. The telecommunications backbone conductor and grounding equalizer conductor size shall not be less than 2 kcmils/linear foot (1 sq. mm/linear meter) of conductor length, up to a maximum size of No. 3/0 AWG unless otherwise indicated.

F. Security Enclosures and Equipment Racks: Bond metallic components of enclosures to the telecommunications bonding and grounding system. Install top-mounted rack grounding busbar unless the enclosure and rack are manufactured with the busbar. Bond the equipment grounding busbar to the TGB No. 6 AWG bonding conductors.

G. Structural Steel: Where the structural steel of a steel frame building is readily accessible within the room or space, bond each TGB and TMGB to the vertical steel of the building frame.

H. Electrical Power Panelboards: Where an electrical panelboard for Security equipment is located in the same room or space, bond each TGB to the ground bar of the panelboard.

I. Shielded Cable: Bond the shield of shielded cable to the TGB in Security rooms and spaces. Comply with TIA-568-C.1 and TIA-568-C.2 when grounding shielded balanced twisted-pair cables.

J. Rack- and Cabinet-Mounted Equipment: Bond powered equipment chassis to the cabinet or rack grounding bar. Power connection shall comply with NFPA 70; the equipment grounding conductor in the power cord of cord- and plug-connected equipment shall be considered as a supplement to bonding requirements in this Section.

K. Access Floors: Bond all metal parts of access floors to the TGB.

L. Equipment Room Signal Reference Grid: Provide a low-impedance path between Security cabinets, equipment racks, and the reference grid, using No. 6 AWG bonding conductors.

1. Install the conductors in grid pattern on 4 foot (1200 mm) centers, allowing bonding of one pedestal from each access floor tile.
2. Bond the TGB of the equipment room to the reference grid at two or more locations.
3. Bond all conduits and piping entering the equipment room to the TGB at the perimeter of the room.

M. Towers and Antennas:

1. Ground Ring: Buried at least 30 inches (760 mm) below grade and at least 24 inches (610 mm) from the base of the tower or mounting.
2. Bond each tower base and metallic frame of a dish to the ground ring, buried at least 18 inches (460 mm) below grade.
3. Bond the ground ring and antenna grounds to the equipment room TMGB or TGB, buried at least 30 inches (760 mm) below grade.
4. Bond metallic fences within 6 feet (1.8 m) of towers and antennas to the ground ring, buried at least 18 inches (460 mm) below grade.
5. Special Requirements for Roof-Mounted Towers:
    a. Roof Ring: Meet requirements for the ground ring except the conductors shall comply with requirements in Section 264113 "Lightning Protection for Structures."
    b. Bond tower base footings steel, the TGB in the equipment room, and antenna support guys to the roof ring.
    c. Connect roof ring to the perimeter conductors of the lightning protection system.
6. Waveguides and Coaxial Cable:
    a. Bond cable shields at the point of entry into the building to the TGB and to the cable entrance plate, using No. 2 AWG bonding conductors.
    b. Bond coaxial cable surge arrester to the ground or roof ring using bonding conductor size recommended by surge-arrester manufacturer.

3.7 GROUNDING UNDERGROUND DISTRIBUTION SYSTEM COMPONENTS

A. Duct-Bank Grounding Conductor: Bury 12 inches (300 mm) above duct bank when indicated as part of duct-bank installation.

B. Comply with IEEE C2 grounding requirements.

C. Grounding Manholes and Handholes: Install a driven ground rod through manhole or handhole floor, close to wall, and set rod depth so 4 inches (100 mm) extends above finished floor. If necessary, install ground rod before manhole is placed and provide No. 1/0 AWG bare, tinned-copper conductor from ground rod into manhole through a waterproof sleeve in manhole wall. Protect ground rods passing through concrete floor with a double wrapping of pressure-sensitive insulating tape or heat-shrunk insulating sleeve from 2 inches (50 mm) above to 6 inches (150 mm) below concrete. Seal floor opening with waterproof, nonshrink grout.

D. Grounding Connections to Manhole Components: Bond exposed-metal parts such as inserts, cable racks, pulling irons, ladders, and cable shields within each manhole or handhole, to ground rod or grounding conductor. Make connections with No. 4 AWG minimum, bonding conductor. Train conductors level or plumb around corners and fasten to manhole walls. Connect grounding conductors to cable armor and cable shields according to written instructions by manufacturer of splicing and termination kits.

3.8 IDENTIFICATION

A. Labels shall be preprinted or computer-printed type.

1. Label TMGB(s) with "fs-TMGB," where "fs" is the Security space identifier for the space containing the TMGB.
2. Label TGB(s) with "fs-TGB," where "fs" is the Security space identifier for the space containing the TGB.
3. Label the BCT and each telecommunications backbone conductor at its attachment point: "WARNING! TELECOMMUNICATIONS BONDING CONDUCTOR. DO NOT REMOVE OR DISCONNECT!"

3.9 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Tests and Inspections:

1. Inspect physical and mechanical condition. Verify tightness of accessible, bolted, electrical connections with a calibrated torque wrench according to manufacturer's written instructions.
2. Test the bonding connections of the system using an ac earth ground-resistance tester, taking two-point bonding measurements in each telecommunications equipment room containing a TMGB and a TGB and using the process recommended by BICSI TDMM. Conduct tests with the facility in operation.

    a. Measure the resistance between the busbar and the nearest available grounding electrode. The maximum acceptable value of this bonding resistance is 100 milliohms.
3. Test for ground loop currents using a digital clamp-on ammeter, with a full-scale of not more than 10 A, displaying current in increments of 0.01 A at an accuracy of plus/minus 2.0 percent.

    a. With the grounding infrastructure completed and the Security system electronics operating, measure the current in every conductor connected to the TMGB and in each TGB. Maximum acceptable ac current level is 1 A.

C. Excessive Ground Resistance: If resistance to ground at the BCT exceeds 5 ohms, notify Architect promptly and include recommendations to reduce ground resistance.

D. Grounding system will be considered defective if it does not pass tests and inspections.

E. Prepare test and inspection reports.

END OF SECTION 270526.10

SECTION 270528.10 - PATHWAYS FOR SECURITY SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

B. Section 280500.10 Common Work Results for Electronic Security.

1.2 SUMMARY

A. Section Includes:

1. Metal conduits and fittings.
2. Nonmetallic conduits and fittings.
3. Optical-fiber-cable pathways and fittings.
4. Metal wireways and auxiliary gutters.
5. Nonmetallic wireways and auxiliary gutters.
6. Metallic surface pathways.
7. Nonmetallic surface pathways.
8. Boxes, enclosures, and cabinets.
9. Polymer-concrete handholes and boxes for exterior underground cabling.
10. Fiberglass handholes and boxes for exterior underground cabling.

1.3 DEFINITIONS

A. ARC: Aluminum rigid conduit.

B. BICSI: Building Industry Consulting Service International

C. GRC: Galvanized rigid conduit.

D. IMC: Intermediate metal conduit.

E. RTRC: Reinforced thermosetting resin conduit.

F. TIA: Telecommunications Industry Association

1.4 ACTION SUBMITTALS

A. Product data for the following:

1. Surface pathways
2. Wireways and fittings.
3. Tele-power poles.
4. Boxes, enclosures, and cabinets.
5. Underground handholes and boxes.

B. Shop Drawings: For custom enclosures and cabinets and custom underground handholes and boxes. Include plans, elevations, sections, and attachment details.

1.5 INFORMATION SUBMITTALS

A. Seismic Qualification Data: Provide seismic bracing for all pathway racks, enclosures, cabinets, equipment racks, and their mounting provisions, including those for internal components, from manufacturer.

1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
3. Detailed description of equipment anchorage devices on which certification is based and their installation requirements.
4. Detailed description of conduit support devices and interconnections on which certification is based and their installation requirements.

PART 2 - PRODUCTS

2.1 METAL CONDUITS AND FITTINGS

A. Description: Metal raceway of circular cross section with manufacturer-fabricated fittings.

B. General Requirements for Metal Conduits and Fittings:

1. Listed and labeled as defined in NFPA 70, by a nationally recognized testing laboratory, and marked for intended location and application.
2. Comply with TIA-569-D.

C. GRC: Comply with ANSI C80.1 and UL 6.

D. ARC: Comply with ANSI C80.5 and UL 6A.

E. IMC: Comply with ANSI C80.6 and UL 1242.

F. PVC-Coated Steel Conduit: PVC-coated IMC.

1. Comply with NEMA RN 1.
2. Coating Thickness: 0.040 inch (1 mm), minimum.

G. EMT: Comply with ANSI C80.3 and UL 797.

H. Fittings for Metal Conduit: Comply with NEMA FB 1 and UL 514B.

1. Conduit Fittings for Hazardous (Classified) Locations: Comply with UL 1203 and NFPA 70.
2. Fittings for EMT:
    a. Material: Steel.
    b. Type: compression.
3. Expansion Fittings: PVC or steel to match conduit type, complying with UL-467, rated for environmental conditions where installed, and including flexible external bonding jumper.
4. Coating for Fittings for PVC-Coated Conduit: Minimum thickness of 0.040 inch (1 mm), with overlapping sleeves protecting threaded joints.
5. Bushings: Required for all terminating conduit ends.

I. Joint Compound for IMC, GRC, or ARC: Approved, as defined in NFPA 70, by authorities having jurisdiction for use in conduit assemblies, and compounded for use to lubricate and protect threaded conduit joints from corrosion and to enhance their conductivity.

2.2 NONMETALLIC CONDUITS AND FITTINGS

A. Description: Nonmetallic raceway of circular section with manufacturer-fabricated fittings.

B. General Requirements for Nonmetallic Conduits and Fittings:

1. Listed and labeled as defined in NFPA 70, by an NRTL, and marked for intended location and application.
2. Comply with TIA-569-D.

C. RNC: Type EPC-40-PVC or Type EPC-80-PVC, complying with NEMA TC 2 and UL 651 unless otherwise indicated.

D. Rigid HDPE: Comply with UL 651A.

E. Continuous HDPE: Comply with UL 651A.

F. RTRC: Comply with UL 2515A and NEMA TC 14.

G. Fittings: Comply with NEMA TC 3; match to conduit or tubing type and material.

H. Solvents and Adhesives: As recommended by conduit manufacturer.

2.3 OPTICAL FIBER CABLE RIGID PATHWAYS AND FITTINGS

A. Description: Comply with UL 2024; flexible-type pathway with a circular cross section, approved for general-use installation unless otherwise indicated.

B. Conduit Innerduct:

C. Listed and labeled as defined in NFPA 70, by an NRTL, and marked for intended location and application.

D. Comply with TIA-569-D.

2.4 OPTICAL FIBER CABLE FABRIC PATHWAYS AND FITTINGS

A. Description: 2” single or multi cell polyester/nylon textile innerduct containing 1250 lb polyester flat woven pull tape, approved for outdoor/detectable installation unless otherwise indicated.

B. Manufacturer: MaxCell Group.

C. Fittings: Compression-type conduit plugs with locking nuts and inflation-type termination bags.

2.5 METAL WIREWAYS AND AUXILIARY GUTTERS

A. Description: Sheet metal trough of rectangular cross section fabricated to required size and shape, without holes or knockouts, and with hinged or removable covers.

B. General Requirements for Metal Wireways and Auxiliary Gutters:

1. Comply with UL 870 and NEMA 250, Type 1, Type 3R, Type 4, Type 12, unless otherwise indicated, and sized according to NFPA 70.
2. Metal wireways installed outdoors shall be listed and labeled as defined in NFPA 70, by an NRTL, and marked for intended location and application.
3. Comply with TIA-569-D.

C. Fittings and Accessories: Include covers, couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, and other fittings to match and mate with wireways as required for complete system.

D. Wireway Covers: Hinged type unless otherwise indicated.

E. Finish: Manufacturer's standard enamel finish.

2.6 NONMETALLIC WIREWAYS AND AUXILIARY GUTTERS

A. Description: Fiberglass polyester extruded and fabricated to required size and shape, without holes or knockouts. Cover shall be gasketed with oil-resistant gasket material and fastened with captive screws treated for corrosion resistance. Connections shall be flanged and have stainless-steel screws and oil-resistant gaskets.

B. Description: PVC, extruded and fabricated to required size and shape, and having snap-on cover, mechanically coupled connections, and plastic fasteners.

C. General Requirements for Nonmetallic Wireways and Auxiliary Gutters:

1. Listed and labeled as defined in NFPA 70, by an NRTL, and marked for intended location and application.
2. Comply with TIA-569-D.

D. Fittings and Accessories: Couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, and other fittings shall match and mate with wireways as required for complete system.

E. Solvents and Adhesives: As recommended by conduit manufacturer.

2.7 SURFACE METAL PATHWAYS

A. Description: Galvanized steel with snap-on covers, complying with UL 5.

B. Finish: Manufacturer's standard enamel finish in color selected by Architect. Prime coated, ready for field painting.

C. Listed and labeled as defined in NFPA 70, by an NRTL, and marked for intended location and application.

D. Comply with TIA-569-D.

2.8 SURFACE NONMETALLIC PATHWAYS

A. Description: Two- or three-piece construction, complying with UL 5A, and manufactured of rigid PVC.

B. Finish: Texture and color selected by Architect.

C. Product shall comply with UL 94 V-0 requirements for self-extinguishing characteristics.

D. Listed and labeled as defined in NFPA 70, by an NRTL, and marked for intended location and application.

E. Comply with TIA-569-D.

2.9 BOXES, ENCLOSURES, AND CABINETS

A. Description: Enclosures for communications.

B. General Requirements for Boxes, Enclosures, and Cabinets:

1. Comply with TIA-569-D.
2. Boxes, enclosures, and cabinets installed in wet locations shall be listed and labeled as defined in NFPA 70, by an NRTL, and marked for use in wet locations.
3. Box extensions used to accommodate new building finishes shall be of same material as recessed box.
4. Device Box Dimensions: **4 inches** square by **2-1/8 inches** deep (**100 mm** square by **60 mm** deep) and **4 inches** by **2-1/8 inches** by **2-1/8 inches** deep (**100 mm** by **60 mm** by **60 mm** deep).
5. Gangable boxes are allowed.

C. Sheet Metal Outlet and Device Boxes: Comply with NEMA OS 1 and UL 514A.

D. Cast-Metal Outlet and Device Boxes: Comply with NEMA FB 1, ferrous alloy or aluminum, Type FD, with gasketed cover.

E. Metal Floor Boxes:

1. Material: Cast metal or sheet metal.
2. Type: adjustable.
3. Shape: Rectangular.
4. Metal floor boxes shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

F. Nonmetallic Floor Boxes: Nonadjustable, rectangular.

1. Nonmetallic floor boxes shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

G. Small Sheet Metal Pull and Junction Boxes: NEMA OS 1.

H. Cast-Metal Access, Pull, and Junction Boxes: Comply with NEMA FB 1 and UL 1773, cast aluminum with gasketed cover.

I. Nonmetallic Outlet and Device Boxes: Comply with NEMA OS 2 and UL 514C.

J. Hinged-Cover Enclosures: Comply with UL 50 and NEMA 250, Type 1, Type 4, & Type 12, with continuous-hinge cover with flush latch unless otherwise indicated.

1. Metal Enclosures: Steel, finished inside and out with manufacturer's standard enamel.
2. Nonmetallic Enclosures:

    a. Material: Fiberglass.

3. Interior Panels: Steel; all sides finished with manufacturer's standard enamel.

K. Cabinets:

1. NEMA 250, Type per installation location, with removable interior panel and removable front, finished inside and out with manufacturer's standard.
2. Hinged door in front cover with flush latch and concealed hinge.
3. Key latch to match panelboards.
4. Barriers to separate wiring of different systems and voltage.
5. Accessory feet where required for freestanding equipment.
6. Nonmetallic cabinets shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

2.10 FIBERGLASS HANDHOLES AND BOXES

A. Description: Molded of fiberglass-reinforced polyester resin, with frame and covers of fiberglass.

B. General Requirements for Fiberglass Handholes and Boxes:

1. Boxes and handholes for use in underground systems shall be listed and labeled as defined in NFPA 70, by an NRTL, and marked for intended location and application.
2. Boxes installed in wet areas shall be listed and labeled as defined in NFPA 70, by an NRTL, and marked for intended location and application.
3. Comply with TIA-569-D and SCTE 77.

C. Color of Frame and Cover: Gray (sidewalk) or Green.

D. Configuration: Designed for flush burial with open bottom unless otherwise indicated.

E. Cover: Weatherproof, secured by tamper-resistant locking devices and having structural load rating consistent with enclosure and handhole location.

F. Cover Finish: Nonskid finish shall have a minimum coefficient of friction of 0.50.

G. Cover Legend: Molded lettering, "COMMUNICATIONS".

H. Conduit Entrance Provisions: Conduit-terminating fittings shall mate with entering ducts for secure, fixed installation in enclosure wall.

I. Handholes: 12 x 24 inches (300 x 600 mm), minimum.

2.11 UNDERGROUND-LINE WARNING TAPE

A. Tape:

1. Manufacturer: Scotch, Detectable Buried Barricade Tape 407, or approved equivalent.
2. Printing on tape shall be permanent and shall not be damaged by burial operations.
3. Tape material and ink shall be chemically inert and not subject to degradation when exposed to acids, alkalis, and other destructive substances commonly found in soils.
4. Material: Aluminum foil.
5. Width: 3 inches (75 mm).
6. Thickness: 5 mils (0.1 mm).
7. Tensile according to ASTM D 882: 35 lbs/in and 15,000 psi.
8. RoHS 2011/65/EU compliant without exception.

B. Color and Printing:

1. Comply with ANSI Z535.1, ANSI Z535.2, ANSI Z535.3, and ANSI Z535.4.
2. Inscriptions for Orange-Colored Tapes: "CAUTION: BURIED FIBER OPTIC LINE BELOW".

2.12 SOURCE QUALITY CONTROL FOR UNDERGROUND ENCLOSURES

A. Handhole and Pull-Box Prototype Test: Test prototypes of handholes and boxes for compliance with SCTE 77. Strength tests shall be for specified tier ratings of products supplied.

1. Tests of materials shall be performed by an independent testing agency.
2. Strength tests of complete boxes and covers shall be by either an independent testing agency or manufacturer. A qualified registered professional engineer shall certify tests by manufacturer.
3. Testing machine pressure gages shall have current calibration certification complying with ISO 9000 and ISO 10012, and traceable to NIST standards.

PART 3 - EXECUTION

3.1 GROUNDING

A. Comply with requirements in Section 270526.10 "Grounding and Bonding for Security Systems" for grounding conductors and connectors.

3.2 PATHWAY APPLICATION

A. Outdoors: Apply pathway products as specified below unless otherwise indicated:

1. Exposed Conduit: IMC.
2. Concealed Conduit, Aboveground: IMC.
3. Underground Conduit: RNC, Type EPC-40-PVC.
4. Boxes and Enclosures, Aboveground: NEMA 250, Type 4.

B. Indoors: Apply pathway products as specified below unless otherwise indicated:

1. Exposed, Not Subject to Physical Damage: EMT.
2. Exposed, Not Subject to Severe Physical Damage: EMT.
3. Exposed and Subject to Severe Physical Damage: IMC. Pathway locations include the following:
    a. Loading dock.
    b. Corridors used for traffic of mechanized carts, forklifts, and pallet-handling units.
    c. Mechanical rooms.
    d. Gymnasiums
4. Concealed in Ceilings and Interior Walls and Partitions: EMT, and innerduct.
5. Damp or Wet Locations: IMC.
6. Pathways for Optical-Fiber and Communications Cable in Spaces Used for Environmental Air: Plenum-type, optical-fiber-cable pathway, Plenum-type, communications-cable pathway, EMT.
7. Pathways for Optical-Fiber and Communications-Cable Risers in Vertical Shafts: Riser-type, optical-fiber-cable pathway Riser-type, communications-cable pathway, EMT.
8. Pathways for Concealed General-Purpose Distribution of Optical-Fiber or Communications Cable: General-use, optical-fiber-cable pathway, Riser-type, optical-fiber-cable pathway, Plenum-type, optical-fiber-cable pathway, General-use, communications-cable pathway, Riser-type, communications-cable pathway, Plenum-type, communications-cable pathway, EMT.
9. Boxes and Enclosures: NEMA 250, Type 1, except use NEMA 250, Type 4 nonmetallic units in institutional and commercial kitchens and damp or wet locations.

C. Minimum Pathway Size: 3/4-inch (21-mm) trade size for copper and aluminum cables, and 1 inch (25 mm) for optical-fiber cables.

D. Pathway Fittings: Compatible with pathways and suitable for use and location.

1. Rigid and Intermediate Steel Conduit: Use threaded rigid steel conduit fittings unless otherwise indicated. Comply with NEMA FB 2.10.
2. PVC Externally Coated, Rigid Steel Conduits: Use only fittings listed for use with this type of conduit. Patch and seal all joints, nicks, and scrapes in PVC coating after installing conduits and fittings. Use sealants recommended by fitting manufacturer and apply in thickness and number of coats recommended by manufacturer.
3. EMT: Use compression, steel fittings. Comply with NEMA FB 2.10.

E. Do not install aluminum conduits, boxes, or fittings in contact with concrete or earth.

F. Install surface pathways only where indicated on Drawings.

G. Do not install nonmetallic conduit where ambient temperature exceeds 120 deg F (49 deg C).

3.3 INSTALLATION

A. Comply with the following standards for installation requirements except where requirements on Drawings or in this Section are stricter:

1. NECA 1.
2. NECA/BICSI 568.
3. TIA-569-D.
4. NECA 101
5. NECA 102.
6. NECA 105.
7. NECA 111.

B. Comply with NFPA 70 limitations for types of pathways allowed in specific occupancies and number of floors.

C. Comply with requirements in Section 078413 "Penetration Firestopping" for firestopping materials and installation for penetrations through fire-rated walls, ceilings, and assemblies.

D. Comply with requirements in Section 270544.10 "Sleeves and Sleeve Seals for Security Pathways and Cabling" for sleeves and sleeve seals for communications.

E. Label all security conduits with blue marking band or blue paint every 10 feet (9000 mm). Paint security junction box covers with paint manufactured by Benjamin Moore #791, Duron 5085A (Americana) or approved equivalent.

F. Keep pathways at least 6 inches (150 mm) away from parallel runs of flues and steam or hot-water pipes. Install horizontal pathway runs above water and steam piping.

G. Complete pathway installation before starting conductor installation.

H. Arrange stub-ups so curved portions of bends are not visible above finished slab.

I. Install no more than the equivalent of two 90-degree bends in any pathway run. Support within 12 inches (300 mm) of changes in direction. Utilize long radius ells for all optical-fiber cables.

J. Conceal rigid conduit within finished walls, ceilings, and floors unless otherwise indicated. Install conduits parallel or perpendicular to building lines.

K. Support conduit within 12 inches (300 mm) of enclosures to which attached.

L. Pathways Embedded in Slabs:

1. Run conduit larger than 1 inch (27-mm) trade size, parallel or at right angles to main reinforcement. Where at right angles to reinforcement, place conduit close to slab support. Secure pathways to reinforcement at maximum 10 foot (3 m) intervals.
2. Arrange pathways to cross building expansion joints at right angles with expansion fittings. Comply with requirements for expansion joints specified in this article.
3. Arrange pathways to keep a minimum of 1 inch (25 mm) of concrete cover in all directions.
4. Do not embed threadless fittings in concrete unless specifically approved by Architect for each specific location.
5. Change from nonmetallic conduit and fittings to IMC and fittings before rising above floor.

M. Stub-ups to Above Recessed Ceilings and Conduit Terminations at Cable Trays:

1. Use EMT, IMC, or RMC for pathways.
2. Use a conduit bushing or insulated fitting to terminate stub-ups not terminated in hubs or in an enclosure.

N. Threaded Conduit Joints, Exposed to Wet, Damp, Corrosive, or Outdoor Conditions: Apply listed compound to threads of pathway and fittings before making up joints. Follow compound manufacturer's written instructions.

O. Coat field-cut threads on PVC-coated pathway with a corrosion-preventing conductive compound prior to assembly.

P. Terminate threaded conduits into threaded hubs or with locknuts on inside and outside of boxes or cabinets. Install insulated bushings on conduits terminated with locknuts.

Q. Install pathways square to the enclosure and terminate at enclosures with locknuts. Install locknuts hand tight plus one additional quarter-turn.

R. Do not rely on locknuts to penetrate nonconductive coatings on enclosures. Remove coatings in the locknut area prior to assembling conduit to enclosure, to assure a continuous ground path.

S. Cut conduit perpendicular to the length. For conduits of 2 inch (50 mm) trade size and larger, use roll cutter or a guide to ensure cut is straight and perpendicular to the length.

T. Install pull wires in empty pathways. Use polypropylene or monofilament plastic line with not less than 200 lb (90 kg) tensile strength. Leave at least 12 inches (300 mm) of slack at each end of pull wire. Secure pull wire, so it cannot fall into conduit. Cap pathways designated as spare alongside pathways in use.

U. Surface Pathways:

1. Install surface pathway with a minimum 2 inch (50-mm) radius control at bend points.
2. Secure surface pathway with screws or other anchor-type devices at intervals not exceeding 48 inches (1200 mm) and with no less than two supports per straight pathway section. Support surface pathway according to manufacturer's written instructions. Tape and glue are not acceptable support methods.

V. Pathways for Optical-Fiber and Communications Cable: Install pathways, metal and nonmetallic, rigid and flexible, as follows:

1. ¾ Inch (21 mm) Trade Size and Smaller: Install pathways in maximum lengths of 50 feet (15 m).
2. 1 Inch (25 mm) Trade Size and Larger: Install pathways in maximum lengths of 75 feet (23 m).
3. Install with a maximum of two 90-degree bends or equivalent for each length of pathway unless Drawings show stricter requirements. Separate lengths with pull or junction boxes or terminations at distribution frames or cabinets where necessary to comply with these requirements.

W. Fabric Pathways for Optical-Fiber-Cable:

1. Install per manufacturer’s recommendations and guidelines.

2. Provide textile innerduct in conduit and wire ways, and place textile innerduct within and under cable trays using continuous, unspliced lengths of textile innerduct between maintenance holes, pull boxes, and/or termination points as indicated on the Drawings.
3. Do not fasten textile innerduct to steam, water, or other piping, ductwork, mechanical equipment, electrical equipment, electrical raceways, or wires.
4. Cable Tray and Runway Installation: Cut incisions every 24 inches (61 cm) into the edge of the textile innerduct and cable wrap to one side of vertical ladder rack or horizontal ladder-type cable tray at each incision.

X. Install pathway-sealing fittings at accessible locations according to NFPA 70 and fill them with listed sealing compound. For concealed pathways, install each fitting in a flush steel box with a blank cover plate having a finish similar to that of adjacent plates or surfaces. Install pathway-sealing fittings according to NFPA 70.

Y. Install devices to seal pathway interiors at accessible locations. Locate seals, so no fittings or boxes are between the seal and the following changes of environments. Seal the interior of all pathways at the following points:

1. Where conduits pass from warm to cold locations, such as boundaries of refrigerated spaces.
2. Where an underground service pathway enters a building or structure.
3. Where otherwise required by NFPA 70.

Z. Comply with manufacturer's written instructions for solvent welding PVC conduit and fittings.

AA. Expansion-Joint Fittings:

1. Install in each run of aboveground RNC that is located where environmental temperature change may exceed 30 deg F (17 deg C), and that has straight-run length that exceeds 25 feet (7.6 m). Install in each run of aboveground RMC and EMT that is located where environmental temperature change may exceed 100 deg F (55 deg C), and that has straight-run length that exceeds 100 feet (30 m).
2. Install type and quantity of fittings that accommodate temperature change listed for each of the following locations:

    a. Outdoor Locations Not Exposed to Direct Sunlight: 125 deg F (70 deg C) temperature change.
    b. Outdoor Locations Exposed to Direct Sunlight: 155 deg F (86 deg C) temperature change.
    c. Indoor Spaces Connected with Outdoors without Physical Separation: 125 deg F (70 deg C) temperature change.
    d. Attics: 135 deg F (75 deg C) temperature change.

3. Install fitting(s) that provide expansion and contraction for at least 0.00041 inch per foot of length of straight run per deg F (0.06 mm per meter of length of straight run per deg C) of temperature change for PVC conduits. Install fitting(s) that provide expansion and contraction for at least 0.000078 inch per foot of length of straight run per deg F (0.0115

mm per meter of length of straight run per deg C) of temperature change for metal conduits.

4. Install expansion fittings at all locations where conduits cross building or structure expansion joints.
5. Install each expansion-joint fitting with position, mounting, and piston setting selected according to manufacturer's written instructions for conditions at specific location at time of installation. Install conduit supports to allow for expansion movement.

BB. Hooks (Telecommunications Only, Not allowed for Security):

1. Size to allow a minimum of 25 percent future capacity without exceeding design capacity limits.
2. Shall be supported by dedicated support wires. Do not use ceiling grid support wire or support rods.
3. Hook spacing shall allow no more than 6 inches (150 mm) of slack. The lowest point of the cables shall be no less than 6 inches (150 mm) adjacent to ceilings, mechanical ductwork and fittings, luminaires, power conduits, power and telecommunications outlets, and other electrical and communications equipment.
4. Space hooks no more than 5 feet (1.5 m) o.c.
5. Provide a hook at each change in direction.

CC. Mount boxes at heights indicated on Drawings. If mounting heights of boxes are not individually indicated, give priority to ADA requirements. Install boxes with height measured to center of box unless otherwise indicated.

DD. Recessed Boxes in Masonry Walls: Saw-cut opening for box in center of cell of masonry block, and install box flush with surface of wall. Prepare block surface to provide a flat surface for a raintight connection between box and cover plate or supported equipment and box.

EE. Horizontally separate boxes mounted on opposite sides of walls, so they are not in the same vertical channel.

FF. Support boxes of three gangs or more from more than one side by spanning two framing members or mounting on brackets specifically designed for the purpose.

GG. Fasten junction and pull boxes to or support from building structure. Do not support boxes by conduits.

HH. Set metal floor boxes level and flush with finished floor surface.

II. Set nonmetallic floor boxes level. Trim after installation to fit flush with finished floor surface.

JJ. Zip ties may not be used in any fashion for conduit support and/or cable management.

3.4 INSTALLATION OF UNDERGROUND CONDUIT

A. Direct-Buried Conduit:

1. Excavate trench bottom to provide firm and uniform support for conduit. Prepare trench bottom as specified in Section 312000 "Earth Moving" for pipe of less than 6 inches (150 mm) in nominal diameter.
2. Install backfill as specified in Section 312000 "Earth Moving."
3. After installing conduit, backfill and compact. Start at tie-in point, and work toward end of conduit run, leaving conduit at end of run free to move with expansion and contraction as temperature changes during this process. Firmly hand tamp backfill around conduit to provide maximum supporting strength. After placing controlled backfill to within 12 inches (300 mm) of finished grade, make final conduit connection at end of run and complete backfilling with normal compaction as specified in Section 312000 "Earth Moving."
4. Install manufactured duct elbows for stub-ups at poles and equipment and at building entrances through floor unless otherwise indicated. Encase elbows for stub-up ducts throughout length of elbow.
5. Install manufactured rigid steel conduit elbows for stub-ups at poles and equipment and at building entrances through floor.

    a. Couple steel conduits to ducts with adapters designed for this purpose, and encase coupling with 3 inches (75 mm) of concrete around conduit for a minimum of 12 inches (300 mm) on each side of the coupling.
    b. For stub-ups at equipment mounted on outdoor concrete bases and where conduits penetrate building foundations, extend steel conduit horizontally a minimum of 60 inches (1500 mm) from edge of foundation or equipment base. Install insulated grounding bushings on terminations at equipment.

6. Warning Planks: Bury warning planks approximately 12 inches (300 mm) above direct-buried conduits, but a minimum of 6 inches (150 mm) below grade. Align planks along centerline of conduit.
7. Underground-Line Warning Tape:

    a. During backfilling of trenches, install continuous underground-line warning tape directly above cable or raceway at 6 to 8 inches (150 to 200 mm) below finished grade. Use multiple tapes where width of multiple lines installed in a common trench **or** concrete envelope exceeds 16 inches (400 mm) overall.
    b. Install underground-line warning tape for direct-buried cables and cables in raceways.

3.5 INSTALLATION OF UNDERGROUND HANDHOLES AND BOXES

A. Install handholes and boxes level and plumb and with orientation and depth coordinated with connecting conduits to minimize bends and deflections required for proper entrances.

B. Unless otherwise indicated, support units on a level bed of crushed stone or gravel, graded from 1/2-inch (12.5-mm) sieve to No. 4 (4.75-mm) sieve and compacted to same density as adjacent undisturbed earth.

C. Elevation: In paved areas, set so cover surface will be flush with finished grade. Set covers of other enclosures 1 inch (25 mm) above finished grade.

D. Install handholes with bottom below frost line.

E. Install removable hardware, including pulling eyes, cable stanchions, cable arms, and insulators, as required for installation and support of cables and conductors and as indicated. Select arm lengths to be long enough to provide spare space for future cables, but short enough to preserve adequate working clearances in enclosure.

F. Field cut openings for conduits according to enclosure manufacturer's written instructions. Cut wall of enclosure with a tool designed for material to be cut. Size holes for terminating fittings to be used, and seal around penetrations after fittings are installed.

3.6 SLEEVE AND SLEEVE-SEAL INSTALLATION FOR COMMUNICATIONS PENETRATIONS

A. Install sleeves and sleeve seals at penetrations of exterior floor and wall assemblies. Comply with requirements in Section 270544.10 "Sleeves and Sleeve Seals for Security Pathways and Cabling."

3.7 FIRESTOPPING

A. Comply with requirements in Section 078413 "Penetration Firestopping." Do not begin installation work until certificates of conformance or compliance, manufacturer's catalog data, and details for fire stopping of penetrations and joint systems showing compliance with the appropriate UL Design Number are approved by the Office of Safety Health and Environmental Management Fire Protection Engineer.

3.8 PROTECTION

A. Protect coatings, finishes, and cabinets from damage or deterioration.

1. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
2. Repair damage to PVC coatings or paint finishes with matching touchup coating recommended by manufacturer.

END OF SECTION 270528.10

SECTION 270536.10 - CABLE TRAYS FOR SECURITY SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

B. Section 280500.10 Common Work Results for Electronic Security.

1.2 SUMMARY

A. Section Includes:

1. Ladder cable tray.
2. Wire-mesh cable tray.
3. Cable tray accessories.
4. Warning signs.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of cable tray.

1. Include data indicating dimensions and finishes for each type of cable tray indicated.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Seismic Performance: Cable trays and supports shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.

1. The term "withstand" means "the cable trays will remain in place without separation of any parts when subjected to the seismic forces specified."

B. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes in cable tray installed outdoors.

1. Temperature Change: 120 deg F (67 deg C), ambient.

2.2 GENERAL REQUIREMENTS FOR CABLE TRAYS

A. Acceptable Manufacturers:

1. Chatsworth
2. Commscope
3. Legrand
4. Snake Tray

B. Cable Trays and Accessories: Identified as defined in NFPA 70 and marked for intended location, application, and grounding.

1. Source Limitations: Obtain cable trays and components from single manufacturer.

C. Sizes and Configurations: See Drawings for specific requirements for types, sizes, and configurations.

D. Structural Performance: See articles for individual cable tray types for specific values for the following parameters:

1. Uniform Load Distribution: Capable of supporting a uniformly distributed load on the indicated support span when supported as a simple span and tested according to NEMA VE 1.
2. Concentrated Load: A load applied at midpoint of span and centerline of tray.
3. Load and Safety Factors: Applicable to both side rails and rung capacities.

2.3 LADDER CABLE TRAY

A. Description:

1. Configuration: Two longitudinal side rails with transverse rungs swaged or welded to side rails, complying with NEMA VE 1.
2. Width: **12 inches (300 mm)** unless otherwise indicated on Drawings.
3. Rung Spacing: 12 inches (300 mm) o.c.
4. Radius-Fitting Rung Spacing: 9 inches (225 mm) at center of tray's width.
5. Minimum Cable-Bearing Surface for Rungs: 7/8-inch (22-mm) width with radius edges.
6. No portion of the rungs shall protrude below the bottom plane of side rails.
7. Structural Performance of Each Rung: Capable of supporting a maximum cable load, with a safety factor of 1.5, plus a 200 lb (90 kg) concentrated load, when tested according to NEMA VE 1.
8. UL classified for suitability as an equipment grounding conductor.
9. Splicing Assemblies: Bolted type using serrated flange locknuts.

10. Splice-Plate Capacity: Splices located within support span shall not diminish rated loading capacity of cable tray.
11. Materials and Finishes: Steel, black powder-coat finish.

2.4 WIRE-MESH CABLE TRAY (BASKET TRAY)

A. Description:

1. Configuration: Steel wire mesh, complying with NEMA VE 1.
2. Width: **12 inches (300 mm)** unless otherwise indicated on Drawings.
3. Minimum Usable Load Depth: **4 inches (100 mm)**.
4. Straight Section Lengths: 10 feet (3.0 m), except where shorter lengths are required to facilitate tray assembly.
5. Structural Performance: Capable of supporting a maximum cable load, with a safety factor of 1.5, plus a 200 lb (90 kg) concentrated load, when tested according to NEMA VE 1.
6. Class Designation: Comply with NEMA VE 1.
7. Splicing Assemblies: Bolted type using serrated flange locknuts.
8. Splice-Plate Capacity: Splices located within support span shall not diminish rated loading capacity of cable tray.
9. Safety Provisions: Wire ends along wire-basket sides (flanges) rounded during manufacturing to maintain integrity of cables and installer safety.
10. Materials and Finish: Steel. Galvanized before fabrication (pre-galvanized) or painted black with powder coat paint.

2.5 CABLE TRAY ACCESSORIES

A. Fittings: Tees, crosses, risers, elbows, splices, and other fittings as required, of same materials and finishes as cable tray.

B. Splices that electrically bond cable tray sections and fittings together.

C. Divider: Same materials and finishes as for cable tray, installed to separate cable tray into multiple pathways. Dividers to be same height as sidewalls of cable tray.

D. Liner: Solid, black polymer liner for the bottom and sides of the wire mesh cable tray. Size liner to match the width of the cable tray, rated UL 94V-0, non-hydroscopic with moisture absorption <0.1% and rated for temperatures up to 239 deg F (115 deg C).

E. Cable tray supports and connectors, including bonding jumpers and splices, as recommended by cable tray manufacturer.

F. Miscellaneous accessories: Conduit attachment bracket, radius drop,

PART 3 - EXECUTION

3.1 GROUNDING

A. Comply with requirements in Section 270526.10 "Grounding and Bonding for Security Systems" for grounding conductors and connectors.

3.2 CABLE TRAY INSTALLATION

A. Install cable trays according to NEMA VE 2 and cable tray manufacturer’s recommendations.

B. Install cable trays as a complete system, including fasteners, hold-down clips, support systems, barrier strips, dividers, adjustable horizontal and vertical splice plates, elbows, reducers, tees, crosses, cable dropouts, adapters, covers, liners, and bonding.

C. Install cable trays so that the tray is accessible for cable installation and all splices are accessible for inspection and adjustment.

D. Remove burrs and sharp edges from cable trays.

E. Join cable tray with splice plates that maintain electrical bond between sections; use four square neck-carriage bolts and locknuts.

F. Fasten cable tray supports to building structure and install seismic restraints, where required.

G. Design fasteners and supports to carry cable tray, the cables, and a concentrated load of 200 lb (90 kg).

H. Install intermediate supports when cable weight exceeds the load-carrying capacity of the tray rungs.

I. Construct supports from channel members, threaded rods, and other appurtenances furnished by cable tray manufacturer. Arrange supports in center support, trapeze, or wall-bracket form as required by application.

J. Support bus assembly to prevent twisting from eccentric loading.

K. Locate and install supports according to NEMA VE 2. Do not install more than one cable tray splice between supports.

L. Support center support hangers and trapeze hangers for wire-basket trays with threaded rods, sized based on potential maximum tray loading.

M. Make connections to equipment with flanged fittings fastened to cable trays and to equipment. Support cable trays independent of fittings. Do not carry weight of cable trays on equipment enclosure.

N. Install expansion connectors where cable trays cross building expansion joints and in cable tray runs that exceed dimensions recommended in NEMA VE 2. Space connectors and set gaps according to applicable standard.

O. Make changes in direction and elevation using manufacturer's recommended fittings.

P. Make cable tray connections using manufacturer's recommended fittings.

Q. Seal penetrations through fire and smoke barriers. Comply with requirements in Section 078413 "Penetration Firestopping."

R. Install capped metal sleeves for future cables through firestop-sealed cable tray penetrations of fire and smoke barriers.

S. Install cable trays with enough workspace to permit access for installing cables.

T. Install barriers/dividers to separate cables of different systems and type. Install dividers to separate pathways within cable tray for optical fiber cables, and copper communications cables.

U. Install warning signs in visible locations on or near cable trays after cable tray installation.

V. Flattened, dented, or deformed cable tray is not permitted. Remove and replace the damaged cable tray with new undamaged material. Assure cable tray installation does not encroach into the ceiling height head room, walkways, or doorways.

W. Verify that there are no intruding items such as pipes, hangers, or other equipment in the pathway.

3.3 CLEARANCES

A. Keep pathways at least 6 inches (150 mm) away from parallel runs of flues and steam or hot-water pipes. Install horizontal pathway runs above water and steam piping.

B. Clearance requirements for accessibility:

1. Maintain a clearance of 6 inches (152 mm) between top of cable tray and ceiling structure or other equipment or raceway.

C. Clearance requirements from sources of electromagnetic interference (EMI):

1. Maintain a clearance of 5 inches (127 mm) or more from fluorescent lighting.
2. Maintain a clearance of 12 inches (305 mm) or more from conduit and cables used for electrical power distribution.
3. Maintain a clearance of 48 inches (1219 mm) or more from motors or transformers.
4. Pathways shall cross perpendicularly to electrical power cables or conduits.
5. Maintain 6 inches (152 mm) cable separation between unlike signal types.

3.4 EXPOSED WORK

A. Exposed pathway is only permitted as indicated on the drawings or as approved through submittal review process.

B. Install black polymer liner within wire-basket cable tray in all exposed locations, unless otherwise indicated. Cables within these cable trays should not be visible from finished floor level.

3.5 CABLE TRAY GROUNDING

A. Ground cable trays according to NFPA 70 unless additional grounding is specified. Comply with requirements in Section 270526.10 "Grounding and Bonding for Security Systems."

B. Cable trays shall be bonded together with splice plates listed for grounding purposes or with listed bonding jumpers.

C. Cable trays with single-conductor power conductors shall be bonded together with a grounding conductor run in the tray along with the power conductors and bonded to the tray at 72 inch (1800 mm) intervals. The grounding conductor shall be sized according to NFPA 70, Article 250.122, "Size of Equipment Grounding Conductors," and Article 392, "Cable Trays."

D. When using epoxy- or powder-coat painted cable trays as a grounding conductor, completely remove coating at all splice contact points or ground connector attachment. After completing

splice-to-grounding bolt attachment, repair the coated surfaces with coating materials recommended by cable tray manufacturer.

E. Bond cable trays to power source for cables contained within with bonding conductors sized according to NFPA 70, Article 250.122, "Size of Equipment Grounding Conductors."

3.6 CABLE INSTALLATION

A. Install cables only when each cable tray run has been completed and inspected.

B. Fasten cables on horizontal runs with cable clamps or cable ties according to NEMA VE 2. Tighten clamps only enough to secure the cable, without indenting the cable jacket. Install cable ties with a tool that includes an automatic pressure-limiting device.

C. Fasten cables on vertical runs to cable trays every 18 inches (450 mm).

D. Fasten and support cables that pass from one cable tray to another or drop from cable trays to equipment enclosures. Fasten cables to the cable tray at the point of exit and support cables independent of the enclosure. The cable length between cable trays or between cable tray and enclosure shall be no more than 72 inches (1800 mm).

E. In existing construction, remove inactive or dead cables from cable trays.

3.7 CONNECTIONS

A. Remove paint from all connection points before making connections. Repair paint after the connections are completed.

B. Connect pathways to cable trays according to requirements in NEMA VE 2 and NEMA FG 1.

3.8 FIELD QUALITY CONTROL

A. Perform the following tests and inspections:

1. After installing cable trays and after electrical circuitry has been energized, survey for compliance with requirements.
2. Visually inspect cable insulation for damage. Correct sharp corners, protuberances in cable trays, vibrations, and thermal expansion and contraction conditions, which may cause or have caused damage.

3. Verify that the number, size, and voltage of cables in cable trays do not exceed that permitted by NFPA 70. Verify that communications or data-processing circuits are separated from power circuits by barriers or are installed in separate cable trays.
4. Verify that there are no intruding items such as pipes, hangers, or other equipment in the cable tray.
5. Remove dust deposits, industrial process materials, trash of any description, and any blockage of tray ventilation.
6. Visually inspect each cable tray joint and each ground connection for mechanical continuity. Check bolted connections between sections for corrosion. Clean and re-torque in suspect areas.
7. Check for improperly sized or installed bonding jumpers.
8. Check for missing, incorrect, or damaged bolts, bolt heads, or nuts. When found, replace with specified hardware.
9. Perform visual and mechanical checks for adequacy of cable tray grounding; verify that all takeoff raceways are bonded to cable trays. Test entire cable tray system for continuity. Maximum allowable resistance is 1 ohm.

B. Prepare test and inspection reports.

3.9 FIRESTOPPING

A. Comply with requirements in Section 078413 "Penetration Firestopping." Do not begin installation work until certificates of conformance or compliance, manufacturer's catalog data, and details for fire stopping of penetrations and joint systems showing compliance with the appropriate UL Design Number are approved by the Office of Safety Health and Environmental Management Fire Protection Engineer.

3.10 PROTECTION

A. Protect installed cable trays and cables.

1. Install temporary protection for cables in open trays to safeguard exposed cables against falling objects or debris during construction. Temporary protection for cables and cable tray can be constructed of wood or metal materials and shall remain in place until the risk of damage is over.
2. Repair damage to galvanized finishes with zinc-rich paint recommended by cable tray manufacturer.
3. Repair damage to paint finishes with matching touchup coating recommended by cable tray manufacturer.

END OF SECTION 270536.10

SECTION 270544.10 - SLEEVES AND SLEEVE SEALS FOR SECURITY PATHWAYS AND CABLING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

B. Section 280500.10 “Common Work Results for Electronic Security”.

1.2 SUMMARY

A. Section Includes:

1. Sleeves for pathway and cable penetration of non-fire-rated construction walls and floors.
2. Sleeve-seal systems.
3. Sleeve-seal fittings.
4. Grout.
5. Silicone sealants.

B. Related Requirements:

1. Section 078413 "Penetration Firestopping" for penetration firestopping installed in fire-resistance-rated walls, horizontal assemblies, and smoke barriers, with and without penetrating items.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

PART 2 - PRODUCTS

2.1 SLEEVES

A. Wall Sleeves:

1. Steel Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, zinc coated, plain ends.
2. Cast-Iron Pipe Sleeves: Cast or fabricated "wall pipe," equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop unless otherwise indicated.

B. Sleeves for Conduits Penetrating Non-Fire-Rated Gypsum Board Assemblies: Galvanized-steel sheet; 0.0239 inch (0.6 mm) minimum thickness; round tube closed with welded longitudinal joint, with tabs for screw-fastening the sleeve to the board.

C. PVC-Pipe Sleeves: ASTM D 1785, Schedule 40.

D. Molded-PVC Sleeves: With nailing flange for attaching to wooden forms.

E. Molded-PE or -PP Sleeves: Removable, tapered-cup shaped, and smooth outer surface with nailing flange for attaching to wooden forms.

F. Sleeves for Rectangular Openings:

1. Material: Galvanized-steel sheet.
2. Minimum Metal Thickness:
   a. For sleeve cross-section rectangle perimeter less than 50 inches (1270 mm) and with no side larger than 16 inches (400 mm), thickness shall be 0.052 inch (1.3 mm).
   b. For sleeve cross-section rectangle perimeter 50 inches (1270 mm) or more and one or more sides larger than 16 inches (400 mm), thickness shall be 0.138 inch (3.5 mm).

2.2 SLEEVE-SEAL SYSTEMS

A. Description: Modular sealing device, designed for field assembly, to fill annular space between sleeve and pathway or cable.

1. Sealing Elements: EPDM rubber interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.
2. Pressure Plates: Carbon or Stainless steel.
3. Connecting Bolts and Nuts: Carbon steel, with corrosion-resistant coating or Stainless steel of length required to secure pressure plates to sealing elements.

2.3 SLEEVE-SEAL FITTINGS

A. Description: Manufactured plastic, sleeve-type, waterstop assembly made for embedding in concrete slab or wall. Unit shall have plastic or rubber waterstop collar with center opening to match piping OD.

2.4 GROUT

A. Description: Nonshrink; recommended for interior and exterior sealing openings in non-fire-rated walls or floors.

B. Standard: ASTM C 1107/C 1107M, Grade B, post-hardening and volume-adjusting, dry, hydraulic-cement grout.

C. Design Mix: 5000-psi (34.5-MPa), 28-day compressive strength.

D. Packaging: Premixed and factory packaged.

2.5 SILICONE SEALANTS

A. Silicone Sealants: Single-component, silicone-based, neutral-curing elastomeric sealants of grade indicated below.

1. Grade: Pourable (self-leveling) formulation for openings in floors and other horizontal surfaces that are not fire rated.

B. Silicone Foams: Multicomponent, silicone-based liquid elastomers that, when mixed, expand and cure in place to produce a flexible, nonshrinking foam.

PART 3 - EXECUTION

3.1 GROUNDING

A. Comply with requirements in Section 270526.10 "Grounding and Bonding for Security Systems" for grounding conductors and connectors.

3.2 SLEEVE INSTALLATION FOR NON-FIRE-RATED PENETRATIONS

A. Comply with NECA 1.

B. Comply with NEMA VE 2 for cable tray and cable penetrations.

C. Sleeves for Conduits Penetrating Above-Grade Non-Fire-Rated Concrete and Masonry-Unit Floors and Walls:

1. Interior Penetrations of Non-Fire-Rated Walls and Floors:

    a. Seal annular space between sleeve and pathway or cable, using joint sealant appropriate for size, depth, and location of joint. Comply with requirements in Section 079200 "Joint Sealants."
    b. Seal space outside of sleeves with mortar or grout. Pack sealing material solidly between sleeve and wall so no voids remain. Tool exposed surfaces smooth; protect material while curing.

2. Use pipe sleeves unless penetration arrangement requires rectangular sleeved opening.
3. Size pipe sleeves to provide 1/4 inch (6.4 mm) annular clear space between sleeve and pathway or cable unless sleeve seal is to be installed or unless seismic criteria require different clearance.
4. Install sleeves for wall penetrations unless core-drilled holes or formed openings are used. Install sleeves during erection of walls. Cut sleeves to length for mounting flush with both surfaces of walls. Deburr after cutting.
5. Install sleeves for floor penetrations. Extend sleeves installed in floors 2 inches (50 mm) above finished floor level. Install sleeves during erection of floors.

D. Sleeves for Conduits Penetrating Non-Fire-Rated Gypsum Board Assemblies:

1. Use circular metal sleeves unless penetration arrangement requires rectangular sleeved opening.
2. Seal space outside of sleeves with approved joint compound for gypsum board assemblies.

E. Roof-Penetration Sleeves: Seal penetration of individual pathways and cables with flexible boot-type flashing units applied in coordination with roofing work.

F. Aboveground, Exterior-Wall Penetrations: Seal penetrations using steel pipe sleeves and mechanical sleeve seals. Select sleeve size to allow for 1 inch (25 mm) annular clear space between pipe and sleeve for installing mechanical sleeve seals.

G. Underground, Exterior-Wall and Floor Penetrations: Install cast-iron pipe sleeves. Size sleeves to allow for 1 inch (25 mm) annular clear space between pathway or cable and sleeve for installing sleeve-seal system.

3.3 SLEEVE-SEAL-SYSTEM INSTALLATION

A. Install sleeve-seal systems in sleeves in exterior concrete walls and slabs-on-grade at pathway entries into building.

B. Install type and number of sealing elements recommended by manufacturer for pathway or cable material and size. Position pathway or cable in center of sleeve. Assemble mechanical

sleeve seals and install in annular space between pathway or cable and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

3.4 SLEEVE-SEAL-FITTING INSTALLATION

A. Install sleeve-seal fittings in new walls and slabs as they are constructed.

B. Assemble fitting components of length to be flush with both surfaces of concrete slabs and walls. Position water-stop flange to be centered in concrete slab or wall.

C. Secure nailing flanges to concrete forms.

D. Using grout, seal the space around outside of sleeve-seal fittings.

END OF SECTION 270544.10

SECTION 271116.10 - SECURITY CABINETS, RACKS, FRAMES, AND ENCLOSURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

B. Section 280500.10 “Common Work Results for Electronic Security”.

1.2 SUMMARY

A. Section Includes:

1. Low profile wall cabinet
2. Storage Cabinet
3. Rifle Locker
4. Grounding
5. Labeling

1.3 DEFINITIONS

A. Access Provider: An operator that provides a circuit path or facility between the service provider and user. An access provider can also be a service provider.

B. BICSI: Building Industry Consulting Service International.

C. LAN: Local area network.

D. RCDD: Registered communications distribution designer.

E. Service Provider: The operator of a telecommunications transmission service delivered through access provider facilities.

F. TDMM: Telecommunications Distribution Methods Manual

G. TGB: Telecommunications grounding bus bar.

H. TIA: Telecommunications Industry Association

I. TMGB: Telecommunications main grounding bus bar.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for equipment racks and cabinets.
2. Include rated capacities, operating characteristics, electrical characteristics, certifications, standards compliance, and furnished specialties and accessories.

B. Shop Drawings: For communications racks, frames, and enclosures. Include plans, elevations, sections, details, and attachments to other work.

1. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
2. Equipment Racks and Cabinets: Include workspace requirements and access for cable connections.
3. Grounding: Indicate location of TGB and its mounting detail showing standoff insulators and wall-mounting brackets.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer, qualified layout technician, installation supervisor, and field inspector.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: Cabling installer must have personnel certified by BICSI on staff.

1. Layout Responsibility: Preparation of Shop Drawings shall be under direct supervision of RCDD.
2. Installation Supervision: A BICSI Installer 2 (Copper and Fiber, as applicable) shall perform all installation work with a BICIS Technician providing direct supervision of the installation work. Technician shall be present at all times when performing Work of this Section at Project site.
3. Field Inspector: Currently registered by BICSI as RCDD to perform on-site inspection.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Seismic Performance: Equipment shall withstand the effects of earthquake motions determined according to ASCE/SEI 7 <Insert Seismic zone>.

1. The term "withstand" means "the unit will remain in place without separation of any parts when subjected to the seismic forces specified and the unit will be fully operational after the seismic event."

B. UL listed.

C. RoHS compliant.

2.2 BACKBOARDS

A. Backboards: Plywood, fire-retardant treated, 3/4 by 48 by 96 inches (19 by 1220 by 2440 mm). Comply with requirements for plywood backboards specified in Section 061000 "Rough Carpentry."

B. Backboard Paint: Pre-painted white with fire-retardant paint. Paint all six sides with two coats of fire resistant paint. Do not paint over manufacturer's label.

2.3 LOW PROFILE WALL CABINET

A. Acceptable Manufacturers

1. Legrand

B. Legrand VWM-SD-4-36K-BW or approved equivalent.

C. Minimum Required Features and Specifications

1. Provide 4 rack spaces
2. Steel cabinet finished in a durable black powder coat.
3. Rack rail-fixed and pivoting rack rail options that include 10-32 threaded and cage nut mounting options.
4. Rack shall be constructed to swing open for component cabling access.
5. Rack shall have a rear knockout panel with eight (8) 1/2" & 3/4” and nine (9) 1” & 1-1/2” EMT Knockouts.

6. 2-gang junction box within enclosure for NEMA 5-20R Receptacle.
7. Eight (8) fan knockouts in back pan with solid door.
8. Supplied with four (4) vent panels.
9. 1/4-20 grounding and bonding stud.
10. Satisfy the 2007 & 2010 CBC; 2006, 2009 & 2012 IBC; ASCE 7-05 (2005 Edition) & ASCE 7-10 (2010 Edition) and the 2006 & 2009 editions of NFPA 5000 for use in areas of high seismicity, Seismic Use Group III, Zone 4 or Seismic Design Category (SDC) "D" with lateral force requirements for protecting 140 lbs. of essential equipment in locations with the highest level of seismicity and top floor or rooftop installations with an Importance factor (Ip) of 1.5 when used with DWRSR-ZL Latch.
11. UL Listed to UL 2417 in the US and CSA C22.2 No. 60950-1 in Canada.
12. Manufactured by an ISO 9001 and ISO 14001 registered company.
13. Warrantied to be free from defects in material or workmanship under normal use and conditions for the lifetime of the cabinet.

D. Rack and Cabinet Grounding Busbars: Rectangular bars of hard-drawn solid copper, accepting conductors ranging from No. 14 to No. 2/0 AWG, NRTL listed as complying with UL 467, and complying with TIA-607-B. Predrilling shall be with holes for use with lugs specified in this Section.

E. Horizontal Cable Management

1. Middle Atlantic HCM-1D and 2D, or approved equivalent
2. D-ring style, welded steel.
3. Baked-polyester powder coat finish.
4. Refer to Drawings for quantity and size; provide (1) per switch, and (1) per patch panel, minimum.

2.4 STORAGE CABINET

A. Acceptable Manufacturers

1. Global Industrial
2. Approved Equivalent

B. WB603599BK or approved equivalent.

C. Minimum Required Features and Specifications

1. Key Locked
2. Number of Doors: 2
3. Number of Shelves: 4
4. Color: Black
5. Material: Steel
6. Dimensions: 78" (H) x 36" (W) x 18" (D)

2.5 RIFLE LOCKER

A. Acceptable Manufacturers

1. Deister Electronic
2. Approved Equivalent

B. WDC8 or approved equivalent.

C. Minimum Required Features and Specifications

1. Drawers: 8 (locked)
2. Holds up to 8 rifles

2.6 LABELING

A. Comply with TIA-606-B and UL 969 for a system of labeling materials, including label stocks, laminating adhesives, and inks used by label printers.

PART 3 - EXECUTION

3.1 GROUNDING

A. Comply with requirements in Section 270526.10 "Grounding and Bonding for Security Systems" for grounding conductors and connectors.

B. Comply with NECA/BICSI 607.

3.2 INSTALLATION

A. Comply with NECA 1.

B. Comply with BICSI TDMM for layout of communications equipment spaces.

C. Comply with BICSI ITSIMM for installation of communications equipment spaces.

D. Bundle, lace, and train conductors and cables to terminal points without exceeding manufacturer's limitations on bending radii. Install lacing bars and distribution spools.

E. Coordinate layout and installation of communications equipment in racks and room. Coordinate service entrance configuration with service provider.

1. Meet jointly with system providers, equipment suppliers, and Owner to exchange information and agree on details of equipment configurations and installation interfaces.
2. Record agreements reached in meetings and distribute them to other participants.
3. Adjust configurations and locations of distribution frames, cross-connects, and patch panels in equipment spaces to accommodate and optimize configuration and space requirements of communications equipment.
4. Adjust configurations and locations of equipment with distribution frames, cross-connects, and patch panels of cabling systems of other communications, electronic safety and security, and related systems that share space in equipment room.

F. Coordinate location of power raceways and receptacles with locations of communications equipment requiring electrical power to operate.

G. Install grounding according to BICSI ITSIMM, "Bonding, Grounding (Earthing) and Electrical Protection" Ch.

3.3 IDENTIFICATION

A. Coordinate system components, wiring, and cabling complying with TIA-606-B.

B. Comply with requirements in Section 099123 "Interior Painting" for painting backboards. For fire-resistant plywood, do not paint over manufacturer's label.

C. Paint and label colors for equipment identification shall comply with TIA-606-B.

D. Labels shall be machine printed. Type shall be 3/16 inch (5 mm) in height.

END OF SECTION 271116.10

SECTION 271300.10 - SECURITY BACKBONE CABLING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

B. Section 280500.10 “Common Work Results for Electronic Security”.

1.2 SUMMARY

A. Section Includes:

1. 850 nanometer laser-optimized 50/125 micrometer multimode (OM4), indoor tight buffer, optical fiber cable.
2. 850 nanometer laser-optimized 50/125 micrometer multimode (OM4), indoor-outdoor loose tube, optical fiber cable.
3. 850 Nanometer Laser-Optimized, 50/125 Micrometer, riser Rated, indoor-Outdoor, Multimode Optical Fiber Cable (OM4), 6-Strand, loose tube, double-jacket, armored
4. 8.2/125 micrometer single-mode (OS2), PLENUM Rated, Indoor-Outdoor Optical Fiber Cable, 6-Strand, TIGHT BUFFER, ARMORED CABLE
5. 8.2/125 micrometer single-mode (OS2), PLENUM Rated, Indoor-Outdoor Optical Fiber Cable, 12-Strand, TIGHT BUFFER, ARMORED CABLE
6. 8.2/125 micrometer single-mode (OS2), PLENUM Rated, Indoor-Outdoor Optical Fiber Cable, 24-Strand, TIGHT BUFFER, ARMORED CABLE
7. Optical fiber cable connecting hardware, patch panels, and cross-connects.
8. Cabling identification products.

1.3 DEFINITIONS

A. BICSI: Building Industry Consulting Service International.

B. Cross-Connect: A facility enabling the termination of cable elements and their interconnection or cross-connection.

C. ICEA: Insulated Cable Engineers Association

D. ITSIMM: Information Technology Systems Installation Methods Manual

E. RCDD: Registered Communications Distribution Designer.

F. TIA: Telecommunications Industry Association

1.4 OPTICAL FIBER BACKBONE CABLING DESCRIPTION

A. Optical fiber backbone cabling system shall provide interconnections between communications rooms, main terminal space, and entrance facilities in the communications cabling system structure. Cabling system consists of backbone cables, intermediate and main cross-connects, mechanical terminations, and patch cords or jumpers used for backbone-to-backbone cross-connection.

B. Backbone cabling cross-connects may be located in communications equipment rooms or at entrance facilities. Bridged taps and splitters shall not be used as part of backbone cabling.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: Reviewed and stamped by RCDD.

1. System Labeling Schedules: Electronic copy of labeling schedules, in software and format selected by Owner.
2. System Labeling Schedules: Electronic copy of labeling schedules that are part of the cabling and asset identification system of the software.
3. Cabling administration drawings and printouts.
4. Wiring diagrams to show typical wiring schematics including the following:

    a. Backbone Riser Diagram.

5. Cross-connects and patch panels. Detail mounting assemblies, and show elevations and physical relationship between the installed components.

C. Optical fiber cable testing plan.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For RCDD, Installer, installation supervisor, and field inspector.

B. Source quality-control reports.

C. Product Certificates: For each type of product.

D. Field quality-control reports.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: Cabling Installer must have personnel certified by BICSI on staff.

1. Layout Responsibility: Preparation of Shop Drawings, Cabling Administration Drawings and field testing program development by an RCDD.
2. Installation Supervision: Installation shall be under the direct supervision of BICSI certified Technician or Level 2 Installer, who shall be present at all times when Work of this Section is performed at Project site.
3. Testing Supervisor: Currently certified by BICSI as an RCDD to supervise on-site testing.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Test cables upon receipt at Project site.

1. Test optical fiber cable to determine the continuity of the strand end to end. Use optical loss test set.
2. Test optical fiber cable while on reels. Use an optical time domain reflectometer to verify the cable length and locate cable defects, splices, and connector, including the loss value of each. Retain test data and include the record in maintenance data.

1.9 PROJECT CONDITIONS

A. Environmental Limitations: Do not deliver or install cables and connecting materials until wet work in spaces is complete and dry, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. General Performance: Backbone cabling system shall comply with transmission standards in TIA-568-C.1, when tested according to test procedures of this standard.

B. Surface-Burning Characteristics: As determined by testing identical products according to ASTM E 84 by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Flame-Spread Index: 25 or less.
2. Smoke-Developed Index: 50 or less.

C. Communications Pathways and Spaces: Comply with TIA-569-D.

D. Grounding: Comply with TIA-607-B.

2.2 8.2/125 MICROMETER SINGLE-MODE (OS2), PLENUM RATED, INDOOR-OUTDOOR OPTICAL FIBER CABLE, 24-STRAND, TIGHT BUFFER, ARMORED CABLE

A. Acceptable Manufacturers

1. Belden
2. Corning Cable Systems

B. Belden FDSD024A9, Corning (contact manufacturer at time of order) or approved equivalent.

C. Minimum Required Features and Specifications

1. 8.2/125-micrometer, 24 fibers, conductive loose tube, optical fiber cable (OS2).
2. Maximum Attenuation: 0.5 dB/km at 1310 nm; 0.5 dB/km at 1550 nm.
3. Standards:
   a. Comply with TIA-492CAAB for detailed specifications.
   b. Comply with TIA-568-C.3 for performance specifications.
   c. Comply with ICEA S-104-696 for mechanical properties.
4. Jacket:
   a. Jacket Color: Black.
   b. Armored: Corrugated Steel Tape Cable cordage jacket, fiber, unit, and group color shall be according to TIA-598-D.
   c. Imprinted with fiber count, fiber type, and aggregate length at regular intervals not to exceed 40 inches (1000 mm).

5. Listed and labeled by an NRTL acceptable to authorities having jurisdiction as complying with UL 444, UL 1651, and NFPA 70 for the following types:
   a. Plenum Rated, Conductive: Type OFCR, complying with NFPA 262.

2.3 OPTICAL FIBER CABLE HARDWARE

A. Standards:

1. Comply with Fiber Optic Connector Intermateability Standard (FOCIS) specifications of the TIA-604 series.
2. Comply with TIA-568-C.3.

B. Source Limitations: Obtain optical fiber cable hardware from single source and from single manufacturer. Provide cable hardware form same manufacturer as optic fiber cable.

C. Closet Connector Housing

1. Acceptable Manufacturers

   a. Corning
   b. Belden

2. Corning CCH-01U; Belden AX105563, or approved equivalents
3. Minimum Required Features and Specifications

   a. Holds 2 CCH connector panels
   b. One (1) rack unit high
   c. Flush mount in 19” rack
   d. Front and rear access

4. Additional Required Options / Parts

   a. Corning Closet Connector Housing Panel CCH-CP06-A9 or approved equivalent

      1) Holds 6 fibers, Single Mode (OS2)
      2) LC duplex connectors

   b. CCH-01U Strain relief brackets CCH1-STRN-INT or approved equivalent

D. Fiber Patch Panel (FPP) Housing (Surface Mount)

1. Acceptable Manufacturers

   a. Corning

2. Corning WCH-02P or approved equivalent
3. Minimum Required Features and Specifications

a. Holds 2 CCH connector panels
b. Surface/wall mountable

4. Additional Required Options / Parts – Quantity based on configuration

a. Corning Closet Connector Housing Panel CCH-CP12-A9 or approved equivalent

1) Holds up to 12 fibers, single mode (OS2)
2) LC duplex connectors

E. Patch Cords: Factory-made, dual-fiber cables in 36 inch (900 mm) lengths.

F. Connector Type: Type LC duplex complying with TIA-604-10-B.

G. Plugs and Plug Assemblies:

1. Male; color-coded modular telecommunications connector designed for termination of a single optical fiber cable.
2. Insertion loss not more than 0.25 dB.
3. Marked to indicate transmission performance.

H. Jacks and Jack Assemblies:

1. Female; quick-connect, simplex and duplex; fixed telecommunications connector designed for termination of a single optical fiber cable.
2. Insertion loss not more than 0.25 dB.
3. Marked to indicate transmission performance.
4. Designed to snap-in to a patch panel or faceplate.

2.4 IDENTIFICATION PRODUCTS

A. Comply with TIA-606-B and UL 969 for a system of labeling materials, including label stocks, laminating adhesives, and inks used by label printers.

2.5 SOURCE QUALITY CONTROL

A. Factory test multimode optical fiber cables according to TIA-526-14-B and TIA-568-C.3.

B. Factory test pre-terminated optical fiber cable assemblies according to TIA-526-14-B and TIA-568-C.3.

C. Cable will be considered defective if it does not pass tests and inspections.

D. Prepare test and inspection reports.

PART 3 - EXECUTION

3.1 GROUNDING

A. Comply with requirements in Section 270526.10 "Grounding and Bonding for Security Systems" for grounding conductors and connectors.

3.2 WIRING METHODS

A. Wiring Method: Install cables in raceways and cable trays. Conceal raceway and cables except in unfinished spaces.

1. Install plenum cable in interior locations.
2. Comply with requirements for pathways specified in Section 270528.10 "Pathways for Security Systems."

B. Wiring within Enclosures: Bundle, lace, and train cables within enclosures. Connect to terminal points with no excess and without exceeding manufacturer's limitations on bending radii. Provide and use lacing bars and distribution spools.

3.3 INSTALLATION OF OPTICAL FIBER BACKBONE CABLES

A. Comply with NECA 1, NECA 301, and NECA/BICSI 568.

B. General Requirements for Optical Fiber Cabling Installation:

1. Comply with TIA-568-C.1 and TIA-568-C.3.
2. Comply with BICSI ITSIMM, Ch. 6, "Cable Termination Practices."
3. Terminate all cables; no cable shall contain unterminated elements. Make terminations only at indicated outlets, terminals, cross-connects, and patch panels.
4. Cables may not be spliced. Secure and support cables at intervals not exceeding 30 inches (760 mm) and not more than 6 inches (150 mm) from cabinets, boxes, fittings, outlets, racks, frames, and terminals.
5. Install lacing bars to restrain cables, to prevent straining connections, and to prevent bending cables to smaller radii than minimums recommended by manufacturer.
6. Bundle, lace, and train cable to terminal points without exceeding manufacturer's limitations on bending radii, but not less than radii specified in BICSI ITSIMM, "Cabling Termination Practices" Chapter. Use lacing bars and distribution spools.
7. Do not install bruised, kinked, scored, deformed, or abraded cable. Do not splice cable between termination, tap, or junction points. Remove and discard cable if damaged during installation and replace it with new cable.

8. Cold-Weather Installation: Bring cable to room temperature before unreeling. Heat lamps shall not be used for heating.
9. In the communications rooms, provide a 10 foot (3 m) long service loop on each end of cable.
10. Pulling Cable: Comply with BICSI ITSIMM, Ch. 4, "Pulling Cable." Monitor cable pull tensions.
11. Terminate cable on connecting hardware that is rack or cabinet mounted.
12. Placement of Cable into Conduit Risers: Provide conduit risers as indicated on the plans. Use Kellum grips and/or other hanger devices to support the vertical drop of cable and prevent any possible kinking of the cable after installation.
13. Minimum Bend Radius: For static storage, do not bend the cable at any location to less than ten times the outside diameter of the cable or as recommended by the manufacturer. During installation, the cable shall not be bent at any location to less than twenty times the outside diameter of the cable or as recommended by the manufacturer.

C. Open-Cable Installation:

1. Install cabling with horizontal and vertical cable guides in communications spaces with terminating hardware and interconnection equipment.
2. Do not run cable through structural members or in contact with pipes, ducts, or other potentially damaging items.

D. Installation of Cable Routed Exposed under Raised Floors:

1. Install plenum-rated cable only.
2. Install cabling after the flooring system has been installed in raised floor areas.
3. Coil cable 6 feet (1800 mm) long not less than 12 inches (300 mm) in diameter below each feed point.

E. Group connecting hardware for cables into separate logical fields.

3.4 FIRESTOPPING

A. Comply with requirements in Section 078413 "Penetration Firestopping." Do not begin installation work until certificates of conformance or compliance, manufacturer's catalog data, and details for fire stopping of penetrations and joint systems showing compliance with the appropriate UL Design Number are approved by the Office of Safety Health and Environmental Management Fire Protection Engineer.

B. Comply with TIA-569-D, Annex A, "Firestopping."

C. Comply with BICSI ITSIMM, "Firestopping" Chapter.

3.5 IDENTIFICATION

A. Identify system components, wiring, and cabling complying with TIA-606-B.

1. Color-code cross-connect fields and apply colors to voice and data service backboards, connections, covers, and labels.

B. Cable Schedule: Install in a prominent location in each communications room and wiring closet. List incoming and outgoing cables and their designations, origins, and destinations. Protect with rigid frame and clear plastic cover. Furnish an electronic copy of final comprehensive schedules for Project.

C. Cabling Administration Drawings: Show building floor plans with cabling administration-point labeling. Identify labeling convention and show labels for communications closets, backbone pathways and cables, terminal hardware and positions, horizontal cables.

D. Cable and Wire Identification:

1. Label each cable within 4 inches (100 mm) of each termination and tap, where it is accessible in a cabinet or junction or outlet box, and elsewhere as indicated.
2. Exposed Cables and Cables in Cable Trays and Wire Troughs: Label each cable at intervals not exceeding 15 feet (4.5 m).
3. Label each unit and field within distribution racks and frames.
4. Identification within Connector Fields in Equipment Rooms and Wiring Closets: Label each connector and each discrete unit of cable-terminating and connecting hardware.

E. Labels shall be preprinted or computer-printed type with printing area and font color that contrasts with cable jacket color but still complies with requirements in TIA 606-B, for the following:

1. Flexible vinyl or polyester that flexes as cables are bent.

3.6 FIELD QUALITY CONTROL

A. Tests and Inspections:

1. Visually inspect optical fiber jacket materials for NRTL certification markings. Inspect cabling terminations in communications equipment rooms for compliance with color-coding for pin assignments, and inspect cabling connections for compliance with TIA-568-C.1.
2. Visually inspect cable placement, cable termination, equipment and patch cords, and labeling of all components.
3. Optical Fiber Cable Tests:

a. Test instruments shall meet or exceed applicable requirements in TIA-568-C.1. Use only test cords and adapters that are qualified by test equipment manufacturer for channel or link test configuration.
b. Link End-to-End Attenuation Tests:

1) Horizontal and multimode backbone link measurements: Test at 850 or 1300 nm in one direction according to TIA-526-14-B, Method B, One Reference Jumper.
2) Attenuation test results for backbone links shall be less than 2.0 dB. Attenuation test results shall be less than those calculated according to equation in TIA-568-C.1.

c. OTDR Test: Perform optical time domain reflectometer test in the 800 to 1300 nanometers wavelength band on the fiber optic cable after it is installed. Calibrate he optical time domain reflectometer to show anomalies of zero point two (0.2) dB as a minimum. If the optical time domain reflectometer test results are unsatisfactory, replace unsatisfactory segments with a new segment of cable at no cost to the Owner. Test the new segment of cable to demonstrate acceptability. Furnish photographs of the traces to the Owner for each circuit.

B. Document data for each measurement. Print data for submittals in a summary report that is formatted similar to Table 10.1 in BICSI TDMM, or transferred from the instrument to the computer, saved as text files, and submit electronically.

C. Remove and replace cabling where test results indicate that it does not comply with specified requirements.

D. End-to-end cabling will be considered defective if it does not pass tests and inspections.

E. Prepare test and inspection reports.

F. Validation: Test random fiber strands at Owner/Engineer’s discretion to confirm validity of test results. Contractor to perform cable testing in presence of Owner/Engineer using Contractor staff and utilizing same test equipment that was used for final acceptance testing by Contractor. Owner reserves the right to validate up to 100% of installed optical fiber.

END OF SECTION 271300.10

SECTION 271500.10 – SECURITY HORIZONTAL CABLING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

B. Section 280500.10 “Common Work Results for Electronic Security”.

1.2 SUMMARY

A. Section Includes:

1. Category 6 twisted pair cable.
2. Twisted pair cable hardware, including plugs and jacks.
3. Cable management system.
4. Cabling identification products.
5. Grounding provisions for twisted pair cable.
6. Source quality control requirements for twisted pair cable.
7. RS-232 cabling.
8. RS-485 cabling.
9. Low-voltage control cabling.
10. Control-Circuit conductors.

1.3 DEFINITIONS

A. BICSI: Building Industry Consulting Service International

B. Cross-Connect: A facility enabling the termination of cable elements and their interconnection or cross-connection.

C. EMI: Electromagnetic interference.

D. FTP: Shielded twisted pair.

E. F/FTP: Overall foil screened cable with foil screened twisted pair.

F. F/UTP: Overall foil screened cable with unscreened twisted pair.

G. IDC: Insulation displacement connector.

H. LAN: Local area network.

I. Jack: Also commonly called an "outlet," it is the fixed, female connector.

J. Plug: Also commonly called a "connector," it is the removable, male telecommunications connector.

K. RCDD: Registered Communications Distribution Designer.

L. RoHS: Restriction of Hazardous Substances

M. Screen: A metallic layer, either a foil or braid, placed around a pair or group of conductors.

N. Shield: A metallic layer, either a foil or braid, placed around a pair or group of conductors.

O. S/FTP: Overall braid screened cable with foil screened twisted pair.

P. S/UTP: Overall braid screened cable with unscreened twisted pairs.

Q. TIA: Telecommunications Industry Association

R. UTP: Unscreened (unshielded) twisted pair.

1.4 COPPER HORIZONTAL CABLING DESCRIPTION

A. The maximum allowable Category 6 horizontal cable length is 295 feet (90 m). This maximum allowable length does not include an allowance for the length of 16 feet (4.9 m) to the workstation equipment or in the horizontal cross-connect.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: Reviewed and stamped by RCDD.

1. System Labeling Schedules: Electronic copy of labeling schedules that are part of the cabling and asset identification system of the software.
2. Cabling administration Drawings and printouts.
3. Wiring diagrams and installation details of communications equipment, to show location and layout of communications equipment.

C. Category 6 Twisted pair cable testing plan.

D. Samples: Jacks and plugs.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For RCDD, Installer, installation supervisor, and field inspector.

B. Product Certificates: For each type of product.

C. Source quality-control reports.

D. Field quality-control reports.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: Category 6 Cabling Installer must have personnel certified by BICSI on staff.

1. Layout Responsibility: Preparation of Shop Drawings and cabling administration Drawings, and field-testing program development by an RCDD.
2. Installation Supervision: Installation shall be under the direct supervision of BICSI certified Technician or Level 2 Installer, who shall be present at all times when Work of this Section is performed at Project site.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Test cables upon receipt at Project site.

1. Test each pair of twisted pair cable for open and short circuits.

1.9 PROJECT CONDITIONS

A. Environmental Limitations: Do not deliver or install cables and connecting materials until wet work in spaces is complete and dry, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. General Performance: Horizontal cabling system shall comply with transmission standards in TIA-568-C.1, when tested according to test procedures of this standard.

B. Telecommunications Pathways and Spaces: Comply with TIA-569-D.

C. Grounding: Comply with TIA-607-B.

2.2 GENERAL CABLE CHARACTERISTICS

A. Listed and labeled by an NRTL acceptable to authorities having jurisdiction as complying with the applicable standard and NFPA 70 for the following types:

1. Communications, Plenum Rated: Type CM, Type CMG, Type CMP, Type CMR, or Type CMX in metallic conduit installed according to NFPA 70, Article 300.22, "Wiring in Ducts, Plenums, and Other Air-Handling Spaces."

B. Surface-Burning Characteristics: Comply with ASTM E 84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Flame-Spread Index: 25 or less.
2. Smoke-Developed Index: 50 or less.

C. RoHS compliant.

2.3 CATEGORY 6 TWISTED PAIR CABLE, PLENUM RATED

A. Description: Four-pair, balanced-twisted pair cable, certified to meet transmission characteristics of Category 6 cable at frequencies up to 600MHz.

B. Acceptable Manufacturers:

1. Belden

C. Belden 7852A or approved equivalent.

D. Minimum Required Features and specifications:

1. Standard: Comply with NEMA WC 66/ICEA S-116-732 and TIA-568-C.2 for Category 6 cables.
2. Conductors: 100-ohm, 23 AWG solid copper.
3. Shielding/Screening: Unshielded twisted pairs (UTP).
4. Cable Rating: Plenum.
5. Jacket: Blue.

2.4 TWISTED PAIR CABLE HARDWARE

A. Description: Hardware designed to connect, splice, and terminate twisted pair copper communications cable.

B. Acceptable Manufacturers:

1. Belden

C. General Requirements for Twisted Pair Cable Hardware:

1. Comply with the performance requirements of Category 6.
2. Comply with TIA-568-C.2, IDC type, with modules designed for punch-down caps or tools.
3. Terminate cables with connecting hardware of same category or higher.

D. Source Limitations: Obtain twisted pair cable hardware from single source, from single manufacture; same manufacturer as cable.

E. Connecting Blocks:

1. 110-style IDC for Category 6.
2. Provide blocks for the number of cables terminated on the block, plus 25 percent spare, integral with connector bodies, including plugs and jacks where indicated.

3. Number of Terminals per Field: One for each conductor in assigned cables.

F. Patch Panel: Modular panels housing numbered jack units with IDC-type connectors at each jack location for permanent termination of pair groups of installed cables.

1. Belden AX103114

2. Features:
   a. Labeling areas adjacent to conductors.
   b. Replaceable connectors.

c. 24 ports.

3. Construction: 16-gauge steel and mountable on 19 inch (483 mm) equipment racks.
4. Number of Jacks per Field: One for each four-pair conductor group of indicated cables, plus spares and blank positions adequate to suit specified expansion criteria.

G. Patch Cords: Factory-made, four-pair cables in 12 inch (300 mm) lengths; terminated with an eight-position modular plug at each end.

1. Patch cords shall have bend-relief-compliant boots and color-coded icons to ensure performance. Patch cords shall have latch guards to protect against snagging.
2. Patch cords shall have color-coded boots for circuit identification.

H. Plugs and Plug Assemblies:

1. Male; eight position; color-coded modular telecommunications connector designed for termination of a single four-pair, 100-ohm, unshielded or shielded twisted pair cable.
2. Standard: Comply with TIA-568-C.2.
3. Marked to indicate transmission performance.

I. Jacks and Jack Assemblies:

1. Female; eight position; modular; fixed telecommunications connector designed for termination of a single four-pair, 100-ohm, unshielded or shielded twisted pair cable.
2. Designed to snap-in to a patch panel or faceplate.
3. Standard: Comply with TIA-568-C.2.
4. Marked to indicate transmission performance.

2.5 IDENTIFICATION PRODUCTS

A. Comply with TIA-606-B and UL 969 for a system of labeling materials, including label stocks, laminating adhesives, and inks used by label printers.

2.6 GROUNDING

A. Comply with requirements in Section 27052610 "Grounding and Bonding for Security Systems" for grounding conductors and connectors.

B. Comply with TIA-607-B.

2.7 GENERAL WIRE AND CABLE REQUIREMENTS

A. Wire and cable jacket color: blue.

B. Minimum wire and cable requirements for selected equipment and devices are listed in the table below. Provide plenum rated cable and wiring which meets the manufacturer's requirements for all equipment and devices provided.

Device	To Device	Wire Size	# Of Conductors	Belden or Equivalent
DGP	RM-4e	24AWG	4	9842
DGP	RM-4e	18AWG	2	6300UH
DGP OR RM-4e	I/O MODULES	24AWG + 18AWG	2 + 2	6381MD
DGP OR RM-4e	OSDP CARD READER	24AWG + 18AWG	2 + 2	6381MD
DGP OR RM-4e	CONTACT, REX, ELECT LOCK REX	22AWG	2	82442
DGP OR RM-4e	REX, ELECT LOCK, SOUNDER	18AWG	2	6300UH
ELECTRO MAG LOCK	PUSH-TO-EXIT BUTTON	22AWG	2	82442
DGP	MOTION DET / GLASSBREAK	22AWG	4	6541FE
DGP	MOTION DET / GLASSBREAK	18AWG	2	6300UH
DGP	DURESS BUTTON	22AWG	2	82442
DGP	DELAYED EGRESS	22AWG	4	6541FE
DGP	DELAYED EGRESS	18AWG	2	6300UH
NETWORK SWITCH	ETHERNET DEVICE	23AWG	8	7852A
FIBER PATCH PANEL	FIBER PATCH PANEL	SM	06 (STRANDS)	FDSD006A9
FIBER PATCH PANEL	FIBER PATCH PANEL	SM	12 (STRANDS)	FDSD012A9
FIBER PATCH PANEL	FIBER PATCH PANEL	SM	24 (STRANDS)	FDSD024A9

2.8 CABLE IDENTIFICATION PRODUCTS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Brady Corporation
2. Or approved equivalent

B. Comply with UL 969 for a system of labeling materials, including label stocks, laminating adhesives, and inks used by label printers.

2.9 SOURCE QUALITY CONTROL

A. Factory test cables on reels according to TIA-568-C.1.

B. Factory test twisted pair cables according to TIA-568-C.2.

C. Cable will be considered defective if it does not pass tests and inspections.

D. Prepare test and inspection reports.

PART 3 - EXECUTION

3.1 GROUNDING

A. Comply with requirements in Section 270526.10 "Grounding and Bonding for Security Systems" for grounding conductors and connectors.

3.2 WIRING METHODS

A. All security system wiring must be new. Remove existing wiring not noted for reuse.

B. Wiring Method: Install cables in raceways and cable trays, except within consoles, cabinets, desks, and counters, unless otherwise indicated. Conceal raceway and cables, except in unfinished spaces.

1. Comply with requirements for raceways and boxes specified in Section 270528.10 "Pathways for Security Systems."

C. Wiring Method: Conceal conductors and cables in accessible ceilings, walls, and floors where possible.

D. Wiring within Enclosures: Bundle, lace, and train cables within enclosures. Connect to terminal points with no excess and without exceeding manufacturer's limitations on bending radii. Provide and use lacing bars and distribution spools. Install conductors parallel with or at right angles to sides and back of enclosure.

E. Wiring shall be in accordance with local, state and national codes (e.g., NEC Article 760) and as recommended by the manufacturer and compatible with the security system. Number and size and type of conductors shall be as recommended by the security system manufacturer, but not less than 22 AWG twisted shield pair.

F. All field wiring shall be completely supervised. In the event of a primary power failure, disconnected standby battery, removal of any internal modules, or any open circuits in the field wiring, a trouble signal will be activated until the system and its associated field wiring are restored to normal condition.

G. Wiring conductors provided in elevator hoist ways and traveling cables shall be listed and approved for elevator use. Conductor insulation shall be TFN, TFFN, THWN, THHN or other insulation designated as Flame Retardant. Insulation rating shall equal or exceed the maximum normal circuit voltage applied to any conductor within the cable or raceway.

H. Method of Wiring

1. General
   a. Wire each alarm, trouble, and supervisory signal, initiating circuit, communication circuit, and each security notifying appliance circuit for supervised operation.
2. Wiring within Cabinets
   a. Provide wiring within cabinets installed parallel with or at right angles to the sides and back of the enclosure. Connect conductors which are terminated, spliced, or otherwise interrupted in any enclosure associated with the security system to terminal blocks. Mark each terminal in accordance with the wiring diagrams of the system. Make all connections with either crimp-on terminal spade lugs or approved pressure type terminal blocks. Secure terminal blocks in each junction box to the junction box cover plate. No “stick-on” cable ties shall be used within the enclosure.
3. Installation in Ducts or Conduits
   a. Use a cable lubricant compatible with the cable sheathing material on all cables pulled. Attach pulling fixtures to the cable strength members. If indirect attachments are used, match the grip diameter and length to the cable diameter and characteristics. If indirect attachment is used on cables having only central strength members, reduce the pulling forces to ensure the fibers are not damaged from forces being transmitted to the strength member. During pulling, continuously monitor the cable pull line tension and not exceed the maximum tension as given by the cable manufacturer. The mechanical stress placed upon a cable during installation shall not twist or stretch the cable.
      1) Use a cable feeder guide between the cable reel and the face of the duct or conduit to protect the cable and guide it into the duct or conduit as it is played off the reel. As the cable is played off the reel, carefully inspect it for jacket defects. Take precautions during installation to prevent the cable from being kinked or crushed and the minimum bend radius of the cable is not exceeded at any time. Hand feed and guide cables through each manhole and apply additional lubricant at all intermediate manholes.
      2) When practicable, use the center pulling techniques to lower pulling tension. That is, pull the cable from the center point of the cable run towards the end termination points. The method may require the cable to be pulled in successive pulls. If the cable is pulled out of a junction box or manhole, protect the cable from dirt and moisture by laying the cable on a ground covering.
4. Vertically Run Cable
   a. When possible, use gravity to assist in cable pulling; pull cable from top of run to bottom of run. Hand-pull cables if possible; if machine assistance is required, monitor tension and do not exceed the specific cable tension limits. After installation, relieve vertical tension on the cable at maximum intervals of 100 feet (30.48 m) using a split support grip.
5. Termination
   a. End-of-line supervisory resistors or devices are to be provided at the sensor device location. The end of line resistor network shall be per manufacturer’s recommended resistor packs.
      1) Wire field devices with tamper circuits in series with the supervised alarm input.

I. Cable Installation

1. Protect all circuits to avoid interruption of service due to short-circuiting or other conditions which may adversely affect the connecting devices. Each individual signaling circuit shall be classified as a circuit pair.
2. Furnish screw terminal blocks or connectors for all cables which interface with racks, cabinets, consoles, or equipment modules. No more than 2 mm of exposed bare wire may show when either crimped or fastened to a connector block or terminal strip.
3. Permanently label every cable or wire at each end. Marking labels used on cables shall correspond to labels shown on as-built drawings and matrix sheets. Utilize a cable administration and labeling solution compliant TIA/EIA-606-A, such as Panduit TIA/EIA-606-A compliant Cable Identification and Labeling System. Wire cable numbers cannot repeat anywhere on the project. Each terminal of each field terminal strip shall be permanently labeled to show the zone, instrument or item served. Terminal blocks shall be numbered by circuit pairs, such as 1 to 25, 26 to 50, etc. Provide labels as follows:
   a. PACS: “SWH point #”.
   b. Cameras: “Cam #/ NSW #/Port #”.
   c. Intercom: “Intercom/NWS #/Port#.
4. Exercise care in wiring to avoid damage to the cables or the equipment. All joints and connections shall be made with mechanical butt splice connectors. The crimping tool used shall be recommended by the manufacturer. Wire nuts shall not be an acceptable splice method.
5. To reduce the possibility of signal contamination, all cables shall be grouped according to the signals being carried. The horizontal and vertical cable runs should be bundled or grouped as follows:
   a. Low Voltage Power
   b. Signal, Control Cables, and Video Cables
6. Splices shall not be permitted in system wiring between components which are incorporated in the system. Wiring runs must terminate at either a system component or a junction box where wiring is interconnected using terminal strips or connectors. Wire ends shall be prepared for attachment to component terminals in accordance with the recommendations of the equipment manufacturers. If there is no alternative and a wire/cable splice must be made, the Contractor shall notify Owner and request approval through a formal RFI process prior to making the wire splice.
7. Connections at devices shall be fastened with approved crimp connectors. No wire nuts will be permitted. Wire should be twisted four times before a crimp connector is applied. The Manufacturers crimping tool shall be utilized for the crimp connectors of choice. Environmental connectors shall be used in harsh or outdoor environments. Devices requiring connections within metal extrusions associated with perimeter windows and doors are considered to be a harsh environment.
8. All mounted wire ties shall be the screw down type. Wire ties utilizing only an adhesive back are not acceptable.
9. Heat shrink tubing must be installed on all cable ends within cabinets.
10. Cable shields are to be grounded only at the DGP end. Shields are to be carefully insulated to prevent conductor shorts.
11. Permanent labels, attached to each cable end, shall be close to cable ends in cabinets and not hidden from view by cable ties. Labels must be visible without having to cut cable ties to read the number.

J. Grounding Practices

1. The existing single system ground point shall be maintained for all security and security related systems described in the BICSI guidelines and is to be provided and installed by the Contractor.
2. Under no circumstances shall either the conduit or AC neutral be used for the security system ground reference point.

K. Control of Electromagnetic Interference (EMI)

1. The control of EMI is critical to the reliable operations of the systems described in these specifications. It is the responsibility of the Security Contractor to ensure all equipment and systems proposed meet FCC requirements and certifications for type regarding electromagnetic emissions. Submit evidence of such certifications with their pre-fabrication submittals.
2. All equipment shall be installed in accordance with manufacturers' specifications and recommendations to assure compliance with FCC certifications and requirements. This shall include proper installation to maintain case integrity; proper fastening of conductors, wires, cables, and connectors; use of appropriate connectors and fasteners; and following manufacturers' recommendations for grounding practices.
3. Certify compliance with manufacturers' recommendations and specifications regarding control of EMI.

3.3 INSTALLATION OF TWISTED-PAIR HORIZONTAL CABLES

A. Comply with NECA 1 and NECA/BICSI 568.

B. General Requirements for Cabling:

1. Comply with TIA-568-C.0, TIA-568-C.1, and TIA-568-C.2.
2. Comply with BICSI's "Information Transport Systems Installation Methods Manual (ITSIMM), Ch. 5, "Copper Structured Cabling Systems," "Cable Termination Practices" Section.
3. Install 110-style IDC termination hardware unless otherwise indicated.
4. Do not untwist twisted pair cables more than 1/2 inch (12 mm) from the point of termination to maintain cable geometry.
5. Terminate all conductors; no cable shall contain unterminated elements. Make terminations only at indicated outlets, terminals, cross-connects, and patch panels.
6. Cables may not be spliced. Secure and support cables at intervals not exceeding 30 inches (760 mm) and not more than 6 inches (150 mm) from cabinets, boxes, fittings, outlets, racks, frames, and terminals.
7. Install lacing bars to restrain cables, prevent straining connections, and prevent bending cables to smaller radii than minimums recommended by manufacturer.
8. Bundle, lace, and train conductors to terminal points without exceeding manufacturer's limitations on bending radii, but not less than radii specified in BICSI Information Transport Systems Installation Methods Manual, Ch. 5, "Copper Structured Cabling Systems," "Cable Termination Practices" Section. Use lacing bars and distribution spools.
9. Do not install bruised, kinked, scored, deformed, or abraded cable. Do not splice cable between termination, tap, or junction points. Remove and discard cable if damaged during installation and replace it with new cable.

10. Cold-Weather Installation: Bring cable to room temperature before de-reeling. Heat lamps shall not be used for heating.
11. In the communications room, install a 10 foot (3 m) long service loop on each end of cable.
12. Pulling Cable: Comply with BICSI Information Transport Systems Installation Methods Manual, Ch. 5, "Copper Structured Cabling Systems," "Pulling and Installing Cable" Section. Monitor cable pull tensions.

C. Open-Cable Installation:

1. Install cabling with horizontal and vertical cable guides in communications spaces with terminating hardware and interconnection equipment.
2. Cable shall not be run through structural members or in contact with pipes, ducts, or other potentially damaging items.

D. Installation of Cable Routed Exposed under Raised Floors:

1. Install plenum-rated cable only.
2. Install cabling after the flooring system has been installed in raised floor areas.
3. Coil cable 6 feet (1800 mm) long not less than 12 inches (300 mm) in diameter below each feed point.

E. Group connecting hardware for cables into separate logical fields.

F. Separation from EMI Sources:

1. Comply with recommendations from BICSI's "Telecommunications Distribution Methods Manual" and TIA-569-D for separating unshielded copper communication cable from potential EMI sources, including electrical power lines and equipment.
2. Separation between open communications cables or cables in nonmetallic raceways and unshielded power conductors and electrical equipment shall be as follows:

    a. Electrical Equipment Rating Less Than 2 kVA: A minimum of 5 inches (127 mm).
    b. Electrical Equipment Rating between 2 and 5 kVA: A minimum of 12 inches (300 mm).
    c. Electrical Equipment Rating More Than 5 kVA: A minimum of 24 inches (600 mm).

3. Separation between communications cables in grounded metallic raceways and unshielded power lines or electrical equipment shall be as follows:

    a. Electrical Equipment Rating Less Than 2 kVA: A minimum of 2-1/2 inches (64 mm).
    b. Electrical Equipment Rating between 2 and 5 kVA: A minimum of 6 inches (150 mm).
    c. Electrical Equipment Rating More Than 5 kVA: A minimum of 12 inches (300 mm).

4. Separation between communications cables in grounded metallic raceways, power lines, and electrical equipment located in grounded metallic conduits or enclosures shall be as follows:

    a. Electrical Equipment Rating Less Than 2 kVA: No requirement.
    b. Electrical Equipment Rating between 2 and 5 kVA: A minimum of 3 inches (76 mm).
    c. Electrical Equipment Rating More Than 5 kVA: A minimum of 6 inches (150 mm).

5. Separation between Communications Cables and Electrical Motors and Transformers, 5 kVA or HP and Larger: A minimum of 48 inches (1200 mm).
6. Separation between Communications Cables and Fluorescent Fixtures: A minimum of 5 inches (127 mm).

3.4 FIRESTOPPING

A. Comply with requirements in Section 078413 "Penetration Firestopping." Do not begin installation work until certificates of conformance or compliance, manufacturer's catalog data, and details for fire stopping of penetrations and joint systems showing compliance with the appropriate UL Design Number are approved by the Office of Safety Health and Environmental Management Fire Protection Engineer.

B. Comply with TIA-569-D, Annex A, "Firestopping."

C. Comply with "Firestopping Systems" Article in BISCI's "Telecommunications Distribution Methods Manual."

3.5 GROUNDING

A. Install grounding according to the "Grounding, Bonding, and Electrical Protection" chapter in BICSI's "Telecommunications Distribution Methods Manual."

B. Comply with TIA-607-B and NECA/BICSI-607.

C. Bond metallic equipment to the grounding bus bar, using not smaller than a No. 6 AWG equipment grounding conductor.

3.6 IDENTIFICATION

A. Identify system components, wiring, and cabling complying with TIA-606-B. Comply with requirements for identification specified in Section 270553 "Identification for Communications Systems."

1. Color-code cross-connect fields and apply colors to voice and data service backboards, connections, covers, and labels.

B. Cable Schedule: Install in a prominent location in each communications room and wiring closet. List incoming and outgoing cables and their designations, origins, and destinations. Protect with rigid frame and clear plastic cover. Furnish an electronic copy of final comprehensive schedules for Project.

C. Cabling Administration Drawings: Show building floor plans with cabling administration-point labeling. Identify labeling convention and show labels for telecommunications closets, terminal hardware and positions, horizontal cables, work areas and workstation terminal positions, grounding buses and pathways, and equipment grounding conductors.

D. Cable and Wire Identification:

1. Label each cable within 4 inches (100 mm) of each termination and tap, where it is accessible in a cabinet or junction or outlet box, and elsewhere as indicated.
2. Each wire connected to building-mounted devices is not required to be numbered at the device if wire color is consistent with associated wire connected and numbered within panel or cabinet.
3. Exposed Cables and Cables in Cable Trays and Wire Troughs: Label each cable at intervals not exceeding 15 feet (4.5 m).
4. Label each terminal strip, and screw terminal in each cabinet, rack, or panel.
    a. Individually number wiring conductors connected to terminal strips, and identify each cable or wiring group, extended from a panel or cabinet to a building-mounted device, with the name and number of a particular device.
    b. Label each unit and field within distribution racks and frames.
5. Identification within Connector Fields in Equipment Rooms and Wiring Closets: Label each connector and each discrete unit of cable-terminating and -connecting hardware.

E. Labels shall be preprinted or computer-printed type, with a printing area and font color that contrast with cable jacket color but still comply with TIA-606-B requirements for the following:

1. Cables use flexible vinyl or polyester that flexes as cables are bent.

3.7 FIELD QUALITY CONTROL

A. Tests and Inspections:

1. Visually inspect jacket materials for NRTL certification markings. Inspect cabling terminations in communications equipment rooms for compliance with color-coding for pin assignments and inspect cabling connections for compliance with TIA-568-C.1.

2. Visually inspect cable placement, cable termination, grounding and bonding, equipment and patch cords, and labeling of all components.
3. Test twisted pair cabling for DC loop resistance, shorts, opens, intermittent faults, and polarity between conductors. Test operation of shorting bars in connection blocks. Test cables after termination but not cross-connection.

    a. Test instruments shall meet or exceed applicable requirements in TIA-568-C.2. Perform tests with a tester that complies with performance requirements in "Test Instruments (Normative)" Annex, complying with measurement accuracy specified in "Measurement Accuracy (Informative)" Annex. Use only test cords and adapters that are qualified by test equipment manufacturer for channel or link test configuration.

B. Data for each measurement shall be documented. Data for submittals shall be printed in a summary report that is formatted similarly to Table 10.1 in BICSI's "Telecommunications Distribution Methods Manual," or shall be transferred from the instrument to the computer, saved as text files, printed, and submitted.

C. Remove and replace cabling where test results indicate that they do not comply with specified requirements.

D. End-to-end cabling will be considered defective if it does not pass tests and inspections.

E. Prepare test and inspection reports.

END OF SECTION 271500.10

SECTION 280500.10 – COMMON WORK RESULTS FOR ELECTRONIC SECURITY

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

A. Provide the electronic security system (ESS) in accordance with the drawings, specifications, and referenced publications.

B. Perform all work, products, systems integration, engineering, and design work required for the project in order to ensure complete and fully operational systems and proper installation of equipment. Provide calculations and analysis to support design and engineering decisions as specified in submittals. Provide and pay all labor, materials, and equipment, sales and gross receipts and other taxes. Secure and pay for plan check fees, permits, other fees, and licenses necessary for the execution of work as applicable for the project. Give required notices; comply with codes, ordinances, regulations, and other legal requirements of public authorities, which bear on the performance of work.

C. Provide an ESS, installed, programmed, configured, documented, and tested. The security system includes but is not limited to: access control, intrusion detection, video surveillance and assessment, video recording and storage, intercommunication system, fire alarm interface, equipment cabinetry, and uninterruptible power supplies (UPS) interface.

D. The work includes the procurement and installation of electrical wire and cables, the installation and testing of all system components. Inspection, testing, demonstration, and acceptance of equipment, software, materials, installation, documentation, and workmanship, shall be as specified herein. Provide all associated installation support, including the provision of primary electrical input power circuits.

E. Provide repair service replacement parts and on-site service during the warranty period. Guarantee all parts and labor for a term of one (1) year, unless dictated otherwise in this specification from the acceptance date of the system as described in specification 280800.10. The Contractor is responsible for all equipment, software, firmware, licensing, shipping, transportation charges, and expenses associated with the service of the system for one (1) year.

F. Operator training is not required.

1.2 SUMMARY

A. This specification provides general requirements for the overall electronic security system (ESS) applicable to all projects.

1.3 RELATED DOCUMENTS

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

B. This Specification is the base document for electronic security systems. Use the following specification sections in conjunction to provide a complete and fully integrated security management system.

1. 27 0526.10 – Grounding and Bonding for Security Systems
2. 27 0528.10 – Pathways for Security Systems
3. 27 0536.10 – Cable Trays for Security Systems
4. 27 0544.10 – Sleeves and Sleeve Seals for Security Pathways and Cabling
5. 27 1116.10 – Security Cabinets, Racks, Frames, and Enclosures
6. 27 1300.10 – Security Backbone Cabling
7. 27 1500.10 – Security Horizontal Cabling
8. 28 0500.10 – Common Work Results for Electronic Security
9. 28 0507.10 – Power Sources for Electronic Security
10. 28 0513.10 – Servers, Workstations, and Storage for Electronic Security
11. 28 0531.10 – Communications Equipment for Electronic Security
12. 28 0800.10 – Commissioning of Electronic Security
13. 28 1000 – Access Control
14. 28 1515 – Electrified Locking Devices and Accessories
15. 28 1523 – Intercom Entry Systems
16. 28 2000 – Video
17. 28 3100 – Intrusion Detection

C. Requirements of Specification 280500.10 take precedence over Division 01 System Acceptance requirements.

D. Related Sections include the following:

1. Division 01
2. Division 08
   a. Coordinate Division 8 and 28 requirements.
3. Division 12
   a. Coordinate case mounted security sensors and equipment.
4. Division 26
   a. Provide dedicated Emergency Electrical Power (120 VAC) circuits as required to provide full system functionality.
5. Division 27
   a. Shared pathways
   b. Security Cabling
   c. Grounding and Bonding System

1.4 REFERENCES

A. American National Standards Institute (ANSI)

1. ANSI INCITS 92 (1980, R 2003), Data Encryption Standard
2. ANSI/TIA-568.0-D, Rev D (9/2015+Edit:12/2015) , Generic Telecommunications Cabling for Customer Premises
3. ANSI/TIA-568.1-D, Rev D (9/2015), Commercial Building Telecommunications Infrastructure Standard

4. ANSI/TIA-568-C.2, Rev C (8/2009+A1:6/2016), Balanced Twisted-Pair Telecommunications Cabling And Components Standards
5. ANSI/TIA-568-C.3, Rev C (6/2008+A1:10/2011), Optical Fiber Cabling Components Standard
6. ANSI/TIA-568-C.4, Rev C (7/2011), Broadband Coaxial Cabling and Components Standard
7. ANSI/TIA-569, REV D (4/2015), Telecommunications Pathways and Spaces
8. ANSI/TIA-606, Rev B (6/2012+A1:12/2015), Administration Standard for the Telecommunications Infrastructure
9. ANSI/TIA-607, Rev C (11/2015), Generic Telecommunications Bonding and Grounding (Earthing) for Customer Premises
10. ANSI/TIA/EIA 492AAAB Rev B (11/2009), Detail Specification for 50µm Core Diameter / 125µm Cladding Diameter Class Ia Graded-Index Multimode Optical Fibers.
11. ANSI/TIA/EIA-526-14 Revision C (4/2015), Optical Power Loss Measurement of Installed Multimode Fiber Cable Plant; Modification of IEC 61280-4-1 edition 2, Fiber-Optic Communications Subsystem Test Procedures- Part 4-1: Installed Cable Plant-Multimode Attenuation Measurement
12. ANSI/SIA CP-01-2014, Control Panel Standard - Features for False Alarm Reduction

B. ASTM International (ASTM)

1. ASTM A153/A153M-16, Standard Specifications for Zinc Coating (Hot-Dip) on Iron and Steel Hardware
2. ASTM B3-13, Standard Specification for Soft or Annealed Copper Wire
3. ASTM B32-08 (2014), Standard Specification for Solder Metal
4. ASTM C1107/C1107M-14a, Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink)
5. ASTM D709-16, Standard Specification for Laminated Thermosetting Materials
6. ASTM E84-16, Standard Test Method for Surface Burning Characteristics of Building Materials

C. Federal Information Processing Standards (FIPS):

1. FIPS PUB 201 2nd Edition (8/1/2013), Personal Identity Verification (PIV) of Federal Employees and Contractors

D. Institute of Electrical and Electronics Engineers (IEEE)

1. IEEE Std 100 (2000), The Authoritative Dictionary of IEEE Standards Terms
2. IEEE 81, 2012 Edition (12/2012), Guide for Measuring Earth Resistivity, Ground Impedance, and Earth Surface Potentials of a Ground System
3. IEEE 142, 2007 Edition (11/2007), Recommended Practice for Grounding of Industrial and Commercial Power Systems - IEEE Green Book (Color Book Series)
4. IEEE C2 National Electrical Safety Code (NESC), 2017 Edition
5. IEEE C62.41.1, 2002 Edition (11/2002), RN: (12/2008), Guide on Surges Environment in Low Voltage (1000 V and Less) AC Power Circuits
6. IEEE C62.41.2, 2002 Edition (11/2002), CRGD: (12/2012), Recommended Practice on Characterization of Surges in Low-Voltage (1000 V and Less) AC Power Circuits

E. International Organization for Standardization (ISO)

1. ISO 7810, 2003 Edition, A2 (01/2012), Identification Cards – Physical Characteristics

F. National Electrical Contractors Association (NECA)

1. NECA 1 2015 Edition (1-2015), Standard for Good Workmanship in Electrical Construction

G. National Electrical Manufacturers Association (NEMA)

1. NEMA 250, 2014 Edition (1/2014), Enclosures for Electrical Equipment (1000 Volts Maximum)
2. NEMA ICS 1 (2000; R 2015), Industrial Control and Systems: General Requirements
3. NEMA ICS 2 (2000; Errata 3/2008), Industrial Control and Systems: Controllers, Contractors, and Overload Relays Rated 600 Volts
4. NEMA ICS 6 93rd Edition (1993; R 2011), Industrial Control and Systems: Enclosures

H. National Fire Protection Association (NFPA)

1. NFPA 70 2020 Edition (2023), National Electrical Code
2. NFPA 72 2019 Edition (2019), National Fire Alarm and Signaling Code.
3. NFPA 101 2021 Edition (2021), Life Safety Code
4. NFPA 262 2019 Edition (2019), Standard Method of Test for Flame Travel and Smoke of Wires and Cables for Use in Air-Handling Spaces
5. NFPA 730 2020 Edition (1/2020), Guide for Premises Security
6. NFPA 731 2020 Edition (1/2020), Standard for the Installation of Electronic Premises Security Systems

I. National Institute of Standards and Technology (NIST)

1. PIV Card Specifications:
   a. SP 800-73-2 (9/2008), Interfaces for Personal Identity Verification
   b. NISTIR 7284 (2006), Personal Identity Verification Card Management Report
   c. SP 800-76-2 (7/2013), Biometric Data Specification for Personal Identity Verification
   d. SP 800-78-4 (5/2015), Cryptographic Algorithms and Key Sizes for Personal Identity Verification
   e. SP 800-73-4 (4/2016), PIV Card Application and Middleware Interface Test Guidelines
2. PIV Card and Middleware Conformance Testing:
   a. SP 800-85B (2006), PIV Data Model Conformance Test Guidelines
3. PIV Accreditation:
   a. SP 800-96 (2006), PIV Card / Reader Interoperability Guidelines
4. Issuing Organizations:
   a. SP 800-87 Rev 1 (4/2008), Codes for the Identification of Federal and Federally-Assisted Organizations
   b. NISTIR 7337 (2006); Personal Identity Verification Demonstration Summary

J. Security Industry Association (SIA)

1. SIA BIO-01-1993.02 (R2000.06), Biometric Vocabulary Standard
2. SIA DC-01-1988 (R2001.04), DCS Computer Interface (CIS-1) Technical Report

3. SIA DC-03-1990.01 (R2003.10), DCS SIA Format Standard
4. SIA DC-07-2001.04, DCS Computer Interface (CIS-2) Standard

K. Telecommunications Industries Association (TIA)

1. TIA-232 Rev F (10/1997; R 12/2012), Interface Between Data Terminal Equipment and Data Circuit - Terminating Equipment Employing Serial Binary data Exchange
2. EIA/ECA-319 Rev E (12/2005), Cabinets, Racks, Panels, and Associated Equipment
3. TIA-455-3, Rev B (7/2009), Procedure to Measure Temperature Cycling Effects on Optical Fibers, Optical Cable, and Other Passive Fiber Optic Components
4. TIA-455, Rev C (8/2014), General Requirements for Standard Test Procedure for Fiber Optic Fibers, Cables, Transducers, Sensors, Connecting and Terminating Devices, and Other Fiber Optic Components
5. TIA-598 Revision D (7/2014), Optical Fiber Cable Color Coding
6. TIA-604-3 Revision B (8/2004; R 1/2014), FOCIS-3 Fiber Optic Connector Intermateability Standard, Type SC and SC-APC
7. TIA-604-1 1996 Edition (3/1996; R 1/2012), Fiber Optic Connector Intermateability Standard

L. Underwriters Laboratories (UL)

1. UL 6 2014 Edition (11/2014), Electrical Rigid Metal Conduit - Steel
2. UL 50 13th Edition (10/2015), Enclosures for Electrical Equipment, Non-Environmental Considerations
3. UL 50E 2nd Edition (10/2015), Enclosures for Electrical Equipment, Environmental Considerations
4. UL 83 15th Edition (3/2014), Thermoplastic-Insulated Wires and Cables
5. UL 294 6th Edition (2/2015), Access Control System Units
6. UL 444 4th Edition (4/2015), Communications Cables
7. UL 464 10th Edition (1/2016), Audible Signaling Devices for Fire Alarm and Signaling Systems, including Accessories
8. UL 467 10th Edition (3/2013), Standard for Safety Grounding and Bonding Equipment
9. UL 497B 4th Edition (12/2012), Protectors for Data Communication and Fire Alarm Circuits
10. UL 609 11th Edition (3/2015), Local Burglar Alarm Units and Systems
11. UL 634 2009 Edition (12/2009; R 3/2015), Connectors and Switches for Use with Burglar-Alarm Systems
12. UL 636 10th Edition (10/2008; R 1/2013), Holdup Alarm Units and Systems
13. UL 639 8th Edition (5/2012), Intrusion Detection Units
14. UL 681 15th Edition (1/2014), Installation and Classification of Burglar and Holdup Alarm Systems
15. UL 796 11th Edition (5/2016), Printed-Wiring Boards
16. UL 797 9th Edition (12/2012), Electrical Metallic Tubing -- Steel
17. UL 827 8th Edition (2/2015), Central Station Alarm Services
18. UL 910 5th Edition (11/1998), Test for Flame-Propagation and Smoke-Density Values for Electrical and Optical-Fiber Cables Used in Spaces Transporting Environmental Air
19. UL 969 4th Edition (11/2001), Marking and Labeling Systems
20. UL 972 6th Edition (7/2011), Burglary Resisting Glazing Material
21. UL 1037 6th Edition (9/2016), Antitheft Alarms and Devices
22. UL 1076 5th Edition (3/2015), Proprietary Burglar Alarm Units and Systems
23. UL 1424 4th Edition (1/2015), Power-Limited Fire-Alarm Circuits

24. UL 1492 (3/2002; R 7/2013), Audio-Video Products and Accessories
25. UL 1581 4th Edition (8/2016), Reference Standard for Electrical Wires, Cables, and Flexible Cords
26. UL 1610 4th Edition (7/2016), Central-Station Burglar-Alarm Units
27. UL 1635 3rd Edition (1/2012; R 3/2015), Digital Alarm Communicator System Units
28. UL 1638 5th Edition (1/2016), Visible Signaling Devices for Fire Alarm and Signaling Systems, including Accessories
29. UL 1638A 1st Edition (6/2016), Visual Signaling Appliances for General Signaling Use
30. UL 1655 2nd Edition (11/2014; R 11/2014), Community-Antenna Television Cables
31. UL 1660 5th Edition (7/2014), Liquid-Tight Flexible Nonmetallic Conduit
32. UL 1666 5th Edition (6/2012), Test for Flame Propagation Height of Electrical and Optical-Fiber Cables Installed Vertically in Shafts
33. UL 1981 3rd Edition (4/2015). Central Station Automation Systems
34. UL 2050 5th Edition (11/2010), National Industrial Security Systems
35. UL 2196 1st Edition (3/2012), Tests for Fire Resistive Cables

1.5 DEFINITIONS

A. ARA: Area of Rescue Assistance

B. Basket Cable Tray: A fabricated structure consisting of wire mesh bottom and side rails.

C. BICSI: Building Industry Consulting Service International

D. Controller: An intelligent peripheral control unit that uses a computer for controlling its operation. Where this term is presented with an initial capital letter, this definition applies.

E. CPU: Central processing unit.

F. Credential: Data assigned to an entity and used to identify that entity.

G. DGP: Data Gathering Panel

H. EMI: Electromagnetic interference.

I. EMT: Electric Metallic Tubing

J. ESS: Electronic Security System

K. GFI: Ground fault interrupter.

L. Identifier: A credential card, keypad personal identification number or code, biometric characteristic, or other unique identification entered as data into the entry-control database for the purpose of identifying an individual. Where this term is presented with an initial capital letter, this definition applies.

M. I/O: Input/Output.

N. INC: Intelligent Network Controller

O. Intrusion Zone (IZ): A space or area for which an intrusion must be detected and uniquely identified, the sensor or group of sensors assigned to perform the detection, and any interface equipment between sensors and communication link to central-station control unit.

P. LAN: Local area network.

Q. LCD: Liquid-crystal display.

R. LED: Light-emitting diode.

S. LOD: Level of Detail

T. LOE: Level of Effort

U. Low Voltage: As defined in NFPA 70 for circuits and equipment operating at less than 50 V or for remote-control and signaling power-limited circuits.

V. M-JPEG: Motion – Joint Photographic Experts Group.

W. MPEG: Moving picture experts group.

X. NEC: National Electrical Code

Y. NECA: National Electrical Contractors Association

Z. NEMA: National Electrical Manufacturers Association

AA. NFPA: National Fire Protection Association

BB. NRTL: Nationally Recognized Testing Laboratory.

CC. Open Cabling: Passing telecommunications cabling through open space (e.g., between the studs of a wall cavity).

DD. OPS: Office of Protection Services

EE. OTDR: Optical Time Domain Reflectometer

FF. PACS: Physical Access Control System

GG. PIR: Passive infrared

HH. PIR Rex: Passive Infrared Request to Exit

II. PPSD: Personnel and Physical Security Division (A department within OPS)

JJ. RCDD: Registered Communications Distribution Designer.

KK. RF: Radio frequency.

LL. RFI: Radio-frequency interference.

MM. RIGID: Rigid conduit is galvanized steel tubing, with a tubing wall that is thick enough to allow it to be threaded.

NN. RS-232: An TIA/EIA standard for asynchronous serial data communications between terminal devices. This standard defines a 25-pin connector and certain signal characteristics for interfacing computer equipment.

OO. RS-485: An TIA/EIA standard for multipoint communications.

PP. SMS: Security Management System – A SMS is a software that incorporates multiple security subsystems (e.g., access control, intrusion detection, closed circuit television, intercom) into a single platform and graphical user interface.

QQ. Standard Intruder: A person who weighs 100 lb. (45 kg) or more and whose height is 1525 mm (60 in) or more; dressed in standard clothing.

RR. Standard-Intruder Movement: Any movement, such as walking, running, crawling, rolling, or jumping, of a "standard intruder" in a protected zone.

SS. TCP/IP: Transport control protocol/Internet protocol incorporated into Microsoft Windows.

TT. TDMM: Telecommunications Distribution Methods Manual

UU. TIA: Telecommunications Industry Association

VV. UPS: Uninterruptible Power Supply

WW. UTP: Unshielded Twisted Pair

XX. VASS: Video Assessment and Surveillance System

YY. VPN: Virtual Private Network

ZZ. WAN: Wide Area Network.

AAA. WAV: The digital audio format used in Microsoft Windows.

BBB. Windows: Operating system by Microsoft Corporation.

CCC. Workstation: A PC with software that is configured for specific limited security system functions.

DDD. WYSIWYG: (What You See Is What You Get.) Text and graphics appear on the screen the same as they will print.

1.6 GENERAL ARRANGEMENT OF CONTRACT DOCUMENTS

A. The Contract Documents supplement to this specification indicates approximate locations of equipment. The installation and/or locations of the equipment and devices shall be governed by the intent of the design; specification and Contract Documents, with due regard to actual site conditions, recommendations, ambient factors affecting the equipment and operations in the

vicinity. The Contract Documents are diagrammatic and do not reveal all offsets, bends, elbows, components, materials, and other specific elements that may be required for proper installation. If any departure from the contract documents is deemed necessary, or in the event of conflicts, the submit details of such departures or conflicts in writing to the owner or owner's representative for his or her comment and/or approval before initiating work.

B. Anything called for by one of the Contract Documents and not called for by the others shall be of like effect as if required or called by all, except if a provision clearly designed to negate or alter a provision contained in one or more of the other Contract Documents shall have the intended effect. In the event of conflicts among the Contract Documents, the Contract Documents shall take precedence in the following order: the Form of Agreement; the Supplemental General Conditions; the Special Conditions; the Specifications with attachments; and the drawings.

1.7 SUBMITTALS

A. General

1. Comply with the Contract Documents and in accordance with this section. Submittals lacking the breath or depth of these requirements will be considered incomplete and rejected. Submissions are considered multidisciplinary and require coordination with applicable divisions to provide a complete and comprehensive submission package. Additional general provisions are as follows:
    a. Schedule submittals to maintain the project schedule. For coordination drawings refer to Division 1 Specification, which outline basic submittal requirements and coordination.
    b. Identify variations from requirements of Contract Documents and state product and system limitations, which may be detrimental to successful performance of the completed work or system.
    c. Submit each package at one (1) time for each review and include components from applicable disciplines (e.g., electrical work, architectural finishes, door hardware, etc.) which are required to produce an accurate and detailed depiction of the project.
    d. Manufacturer's information used for submittal shall have pages with items for approval tagged, items on pages shall be identified, and capacities and performance parameters for review shall be clearly marked through use of an arrow or highlighting. Provide space for COTR and Contractor review stamps.
    e. Drawings shall be in the project specific version of AutoCAD® or REVIT, drawn accurately, and in accordance with Smithsonian Institution CAD and REVIT Standards. FREEHAND SKETCHES OR COPIED VERSIONS OF THE CONSTRUCTION DOCUMENTS WILL NOT BE ACCEPTED. If departures from the drawings are subsequently deemed necessary by the Contractor, submit details of such departures and the reasons thereof in writing to the COTR and the PPSD Security Engineer for approval before initiating work.
    f. Submittal Format
        1) Provide one (1) hard-copy of drawings. Make all other submittals as PDF with bookmarks for sections.
        2) Refer to SI Special Conditions Document for drawing format and content requirements.

B. Pre-Installation Submittals

1. Qualifications
   a. The Security Contractor is not allowed on-site until the Owner approves the Qualifications submittal.
   b. Provide Company certifications
      1) Software House
         a) Certified Integrator
   c. Include qualifications and manufacturer's certifications for individuals working on the project including but not limited to:
      1) Software House
         a) CCURE 9000
      2) American Dynamics
         a) Victor
         b) Video Edge
      3) Zenitel
      4) Cisco
         a) Cisco Certified Network Associate (CCNA)
      5) BICSI
         a) RCDD
   d. Provide project references as outlined in Paragraph 1.11 A "Contractor Qualifications".
2. Product Data
   a. Provide a chart of product data listing the specification section and paragraph number of each product. Annotate if "Provided as Specified" or "Substitution Requested".
   b. Product data sheets organized and bookmarked by Specification Division. Annotate deviations from the design documents and the justification for the change.
   c. Where the words, "or approved equivalent" or like words are used, either furnish the equipment as specified or submit a request for substitution in writing with the make, model, and justification to the COTR and the PPSD Security Engineer for approval.
   d. If the contractor recommends equipment substitution, the contractor is responsible for complete documentation of the reason for the change including price differential and is financially liable for the design time expended by the security consultant to research the substitution.
3. Shop Drawings
   a. Build upon the design documents to reflect current conditions and approved product data. Annotate deviations from the design documents and the justification for the change.
   b. Include wiring diagrams to include but not limited to power supplies, card readers, fire alarm connections, and tamper circuits.
   c. Security door schedule coordinated with Division 8 requirements. Include the following information:
      1) Configuration Number
      2) Door Number (Derived from Architectural Drawings)
      3) Floor Plan Sheet Number
      4) Standard Detail Number
      5) Door Description (Derived from Loading Sheets)
      6) Security Point Number (Derived from Loading Sheets)

7) Door Position or Monitoring Device Type, Make & Model Number
8) Lock Type, Model Number & Power Input/Draw (standby/active)
9) Card Reader Type, Make & Model Number
10) Shunting Device Type, Make & Model Number
11) Sounder Type, Make & Model Number
12) Camera Make & Model Number
13) Misc. devices as required
    a) Delayed Egress Type, Make & Model Number
    b) Intercom Make & Model Number
    c) Electric Transfer Hinge
    d) Electric Pass-through device
14) Remarks column indicating special notes or door configurations

C. Pre-Programming Submittals

1. Nameplates
2. IP Addressing Scheme
    a. Provide OPS with the quantity of devices requiring IP addresses. OPS will then provide the IP addressing scheme.
3. Loading Sheets
    a. Provide loading sheets for each DGP, including input and output boards for all field panels associated with the project.
    b. OPS-PPSD will provide blank electronic sheets for contractor use.
    c. Provide a spreadsheet for each DGP. Name the spreadsheet with the DGP number (e.g. “Site Name DGP-01.xls”)

D. Pre-Acceptance Testing Submittals

1. OPS-PPSD will provide blank testing forms for contractor to reproduce and fill out during testing.
2. Contractor Field Test
    a. Contractor performs the Contractor Field Test (CFT) of all devices utilizing OPS provided forms and submits test results to OPS-PPSD.
3. Performance Verification Test
    a. Based on the OPS-PPSD approval of the Contractor’s Field Test, the COTR will schedule the PVT with the Contractor and OPS-PPSD.
    b. OPS-PPSD will witness the Contractor conduct the PVT of all devices utilizing the same form as for the CFT.

E. Closeout Submittals

1. Project Redlines
    a. Neatly maintain an up-to-date set of construction redlines detailing current location and configuration of the project components.
    b. Mark the redline documents with the words ‘Master Redlines’ on the cover sheet and be maintained by the Contractor in the project office.
    c. Field drawings shall be used for data gathering & field changes. These changes shall be made to the master redline documents daily. Field drawings shall not be considered “master redlines”.
    d. Provide access to redline documents anytime during the project for review and inspection by the COTR or authorized OPS representative.

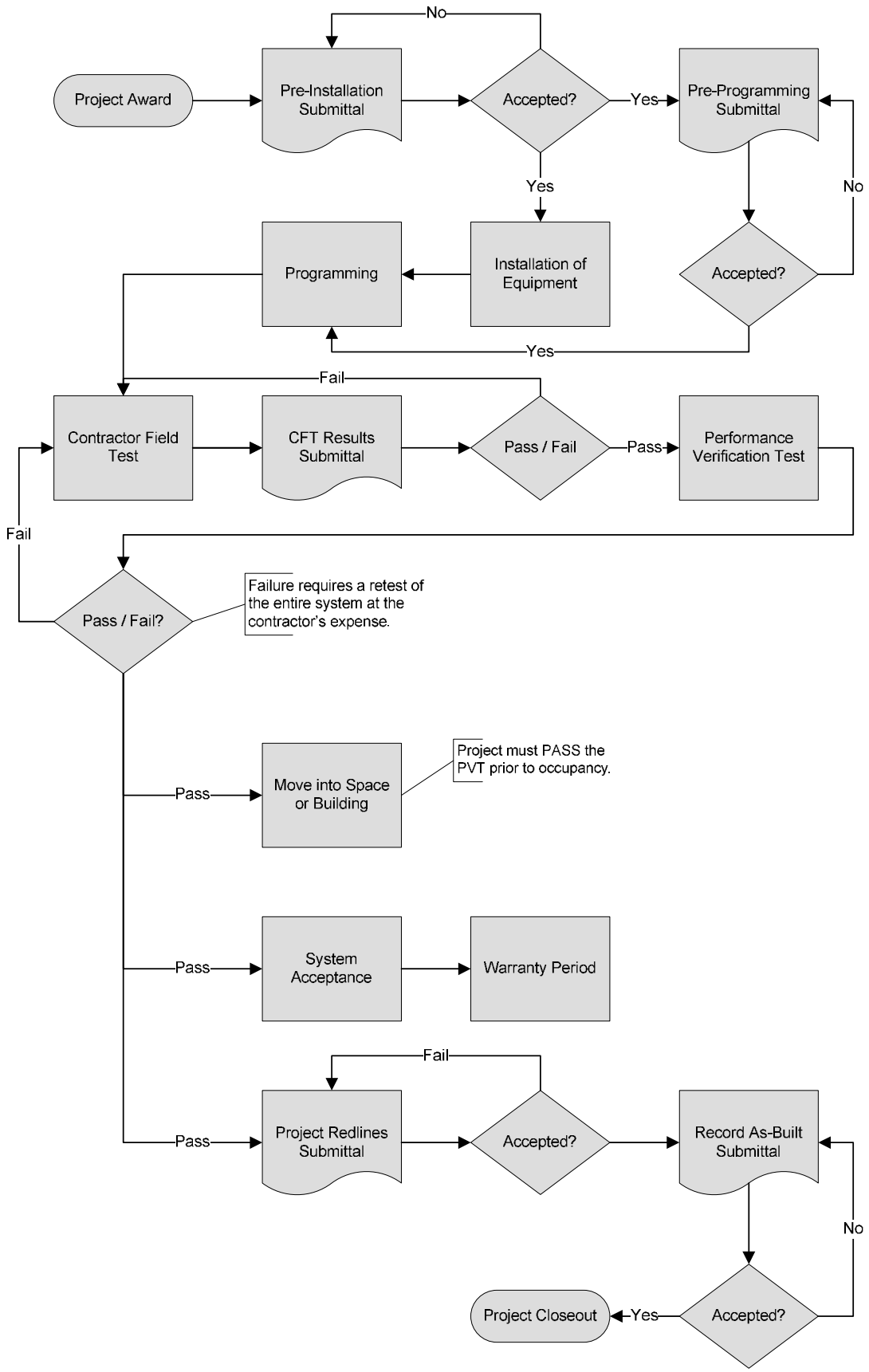
e. Any project component or assembly that is not installed in strict accordance with the drawings shall be so noted on the drawings.
f. Submit the Master Redline document to the COTR and PPSD Security Engineer for review and approval of all changes or modifications to the documents prior to producing Record Construction Documents. The COTR shall be given a minimum of a thirty (30) day review period to determine the adequacy of the Master Redlines. If the master redlines are found suitable by the COTR and the PPSD Security Engineer, the COTR will initial and date each sheet and turn the redlines over to the Contractor for Record As-Built development.

2. Record Construction Documents (Record As-Built)
   a. The submitted as built documents shall be in editable electronic formats and the ownership of the drawings shall be fully relinquished to the owner.

1.8 PROJECT PROCESS DIAGRAM

A. The ESS Project Process Diagram (below) is provided to identify key consecutive or concurrent tasks and milestones required to ensure the project is completed prior to owner occupancy. Substantial completion means all systems have been fully tested and accepted in writing by OPS. Minor or non-life safety related punch list items may continue through owner occupancy but shall be resolved within two (2) weeks of official date of occupancy.

B. The contractor is encouraged to utilize the diagram for the development of project schedules and coordinating submissions.


Project Award
Pre-Installation Submittal
No
Accepted?
Yes
Pre-Programming Submittal
No
Yes
Installation of Equipment
Programming
Accepted?
Yes
Fail
Contractor Field Test
CFT Results Submittal
Pass / Fail
Pass
Performance Verification Test
Fail
Pass / Fail?
Failure requires a retest of the entire system at the contractor's expense.
Pass
Move into Space or Building
Project must PASS the PVT prior to occupancy.
Pass
System Acceptance
Warranty Period
Fail
Pass
Project Redlines Submittal
Accepted?
Record As-Built Submittal
No
Project Closeout
Yes
Accepted?

1.9 COORDINATION

A. Coordinate arrangement, mounting, and support of electronic security equipment:

B. To allow maximum possible headroom unless specific mounting heights that reduce headroom are indicated.

C. To provide for ease of disconnecting the equipment with minimum interference to other installations.

D. To allow right of way for piping and conduit installed at required heights.

E. Ensure raceways, cables, wireways, cable trays, and busways will be clear of obstructions and of the working and access space of other equipment.

F. Coordinate the installation of required supporting discipline devices placement and set sleeves in cast-in-place concrete, masonry walls, and other structural components as they are constructed.

G. Coordinate the locations of access panels and doors for electronic security items that are behind finished surfaces or otherwise concealed. Access doors and panels are specified in Division 08 Section "Access Doors and Frames."

H. Coordinate sleeve selection and application with selection and application of firestopping specified in Division 07 Section "Penetration Firestopping".

1.10 QUALITY ASSURANCE

A. Contractor Qualifications

1. 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. The Contractor shall be an authorized regional representative of the electronic security systems included in the project scope.
2. Provide four (4) current references from clients with systems of similar scope and complexity which 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. The references must include a current point of contact, company or agency name, address, telephone number, complete system description, date of completion, and approximate cost of the project.
3. The owner reserves the option to visit the reference sites, with the site owner's permission and representative, to verify the quality of installation and the references' level of satisfaction with the system.
4. Provide copies of system manufacturer certification for all technicians. Only utilize factory-trained technicians to install, program, and service the electronic security systems. The Lead Technician shall have a minimum of five (5) continuous years of technical experience in electronic security systems.
5. The Contractor shall have a local service facility located within 60 miles of the project site. The local facility shall include sufficient spare parts inventory to support the service requirements associated with this contract. The COTR and the PPSD Security Engineer

reserves the option of visiting the company's facility to verify the service inventory and presence of a local service organization.

6. Lead network engineer onsite configuring the security data network equipment must have a minimum of a Cisco CCNP route/switch certification.
7. Refer to Division 27 Specifications for additional requirements for cabling.

B. Electrical Components, Devices, and Accessories

1. Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

C. Material & Workmanship

1. Unless otherwise specifically provided under this contract, all equipment, material and articles to be incorporated in the work shall be new and of the most suitable grade for the purposes intended.
2. References to any equipment, material, article or patented process, by trade name, make or catalog number shall be regarded as establishing a standard of performance and quality, and shall not be construed as limiting competition.
3. When so directed, the Contractor shall submit samples for approval at the Contractor's expense. Equipment, materials, and articles installed or used without the required approval shall be at the Contractors risk of rejection.
4. Warranties of all work and installed products shall be according to the Contract General Provisions.

1.11 MAINTENANCE & SERVICE

A. General Requirements

1. Provide services required and equipment necessary to maintain the electronic security system in an operational state as specified for a period of one (1) year after formal written acceptance of the system.
2. Provide necessary material required for performing scheduled adjustments or other non-scheduled work. Minimize impacts on facility operations when performing scheduled adjustments or other non-scheduled work. See also General Project Requirements.

B. Description of Work

1. The adjustment and repair of the security system includes the following items computers equipment, communications transmission equipment and data transmission media (DTM), local processors, security system sensors, access control equipment, facility interface, signal transmission equipment, intercoms, and video equipment.

C. Personnel:

1. Service personnel shall be certified in the maintenance and repair of the selected type of equipment and qualified to accomplish all work promptly and satisfactorily. Advise the COTR and the PPSD Security Engineer in writing of the name of the designated service representative, and of any change in personnel. Provide the COTR and the PPSD Security

Engineer with copies of system manufacturer certification for the designated service representative.

D. Emergency Service

1. The owner shall initiate service calls whenever the system is not functioning properly. Provide the owner with an emergency service center telephone number. Staff the emergency service center 24 hours a day 365 days a year.
2. The Smithsonian Institution has sole authority for determining catastrophic and non-catastrophic system failures.
3. Catastrophic system failures are defined as any system failure that the Owner determines will place the facility(s) at increased risk. For catastrophic system failures, provide same day four (4) hour service response with a defect correction time not to exceed eight (8) hours from notification.
4. For non-catastrophic failures, provide eight (8) hour service response with a defect correction time not to exceed 24 hours from notification.

E. Work Request

1. Separately record each service call request, as received. The record shall include the serial number identifying the component involved, its location, date and time the call was received, specific nature of trouble, names of service personnel assigned to the task, instructions describing the action taken, the amount and nature of the materials used, and the date and time of commencement and completion. Deliver a record of the work performed within five (5) working days after the work was completed.

F. System Modifications

1. Make any recommendations for system modification in writing to the COTR and the PPSD Security Engineer. No system modifications, including operating parameters and control settings, shall be made without prior written approval from the COTR and the PPSD Security Engineer.

1.12 PROJECT ENVIRONMENTAL CONDITIONS

A. Control Station

1. Rated for continuous operation in ambient conditions of 60 to 85 deg F (16 to 30 deg C) and a relative humidity of 20 to 80 percent, non-condensing.

B. Interior, Controlled Environment

1. System components, except central-station control unit, installed in temperature-controlled interior environments shall be rated for continuous operation in ambient conditions of 36 to 122 deg F (2 to 50 deg C) dry bulb and 20 to 90 percent relative humidity, non-condensing. NEMA 250, Type 1 enclosure.

C. Interior, Uncontrolled Environment

1. System components installed in non-temperature-controlled interior environments shall be rated for continuous operation in ambient conditions of 0 to 122 deg F (-18 to 50 deg C) dry bulb and 20 to 90 percent relative humidity, non-condensing. NEMA 250, Type 4x enclosures.

D. Exterior Environment

1. System components installed in locations exposed to weather shall be rated for continuous operation in ambient conditions of -30 to 122 deg F (-34 to 50 deg C) dry bulb and 20 to 90 percent relative humidity, condensing. Rate for continuous operation where exposed to rain as specified in NEMA 250, winds up to 137 km/h (85 mph) and snow cover up to 24 in (610 mm) thick. NEMA 250, Type 4X enclosures.

E. Hazardous Environment

1. System components located in areas where fire or explosion hazards may exist because of flammable gases or vapors, flammable liquids, combustible dust, or ignitable fibers shall be rated, listed, and installed according to NFPA 70.

F. Corrosive Environment

1. For system components subjected to corrosive fumes, vapors, and wind-driven salt spray in coastal zones, provide NEMA 250, Type 4X enclosures.

G. Security Environment

1. Use vandal resistant enclosures in high-risk areas where equipment may be subject to damage.

1.13 EQUIPMENT AND MATERIALS

A. General Equipment Requirements

1. Equipment and materials shall be standard, current products of the manufacturer, and be suitable for the systems being installed and the intent of the design.
2. Any material, device, or equipment damages including dents and marred finishes before or during installation and before acceptance of the completed system, shall be replaced unless repairs can be made that are acceptable to the COTR and the PPSD Security Engineer. Any such replacement or repairs, including repairs to the finish, shall be made at no cost to the Owner.
3. Parts of the project site are finished spaces, including paint, trim, wall covering, floor treatments, lighting, and building mechanical systems. Therefore, perform the work specified herein, such that, at the completion of his work, all finished space is restored to the original condition existing prior to the commencement of work. During the course of performing the work specified herein, if the Contractor encounters any damaged finish in any area where the Contractor’s work is to be performed, notify the COTR in writing prior to performing work in that area. Proceed with the work in these areas only after receiving written confirmation that the existing conditions have been documented and authorization has been given to proceed.

B. Nameplates

1. Provide nameplates for all non-field devices accessed by - Smithsonian Institution Security Maintenance Personnel. This includes but is not limited to the following:
   a. Data Gathering Panels
   b. Security Enclosures
   c. Network Switches
   d. Fiber Switches
   e. Servers
   f. Workstations
   g. Power Supplies (including electrical circuit)
   h. Electrical Circuits
2. The laminated plastic shall be 0.06 in (1.6 mm) thick, black with white lettering center core. Nameplates shall be a minimum of 0.75 in (19 mm) high, with a minimum of 0.13 in (3.3 mm) high-engraved block lettering. Attach nameplates with screws or located as required by security documentation plans and specifications. All console monitors shall be labeled with the monitor number and intended function.
3. Submit planned naming conventions for approval.

1.14 COMPONENT ENCLOSURES

A. Tamper Provisions and Tamper Switches

1. Enclosures with terminal strips or circuit boards require tamper switches.
2. Arrange tamper switches to initiate an alarm signal that will report to the monitoring station when the door or cover is moved.
3. Tamper switches shall be inaccessible until the switch is activated. Be connected to circuits which are under electrical supervision at all times, irrespective of the protection mode in which the circuit is operating. Be spring-loaded and held in the closed position by the door or cover and be wired so they break the circuit when the door cover is disturbed. Tamper circuits shall be adjustable type screw sets and shall be adjusted by the contractor to eliminate nuisance alarms associated with incorrectly mounted tamper device shall annunciate prior to the enclosure door opening (within 1/4" tolerance).
4. The single gang junction boxes for the portrait alarming and pull boxes with less than 102 square mm will not require tamper switches.
5. All enclosures over 12 sq in (305 sq mm) shall be hinged with an enclosure lock.
6. Control Enclosures: Maintenance/Safety switches on control enclosures, which must be opened to make routing maintenance adjustments to the system and to service the power supplies, shall be push/pull-set automatic reset type.
7. Provide one (1) enclosure tamper switch for each 24 in (609 mm) of enclosure lock side opening evenly spaced.
8. All security screws shall be Torx-Post Security Screws.

1.15 WARRANTY

A. The Contractor shall, as a condition precedent to the final payment, execute a written guarantee (warranty) to the COTR certifying all contract requirements have been completed according to the final specifications. Contract drawings and the warranty of all materials and equipment furnished under this contract are to remain in satisfactory operating condition (ordinary wear

and tear, abuse and causes beyond his control for this work accepted) for one (1) year from the date the Contactor received written notification of final acceptance from the COTR and the PPSD Security Engineer. Repair or replace all defects or damages due to faulty materials or workmanship without delay, to the COTR's satisfaction, and at the Contractor's expense.

B. When equipment and labor covered by the Contractor's warranty, or by a manufacturer's warranty, have been replaced or restored because of its failure during the warranty period, the warranty period for the replaced or repaired equipment or restored work shall be reinstated for a period equal to the original warranty period, and commencing with the date of completion of the replacement or restoration work. In the event any manufacturer customarily provides a warranty period greater than one (1) year, the Contractor's warranty shall be for the same duration for that component.

PART 2 - PRODUCTS

2.1 THERE ARE NO PRODUCTS IN THIS SPECIFICATION

PART 3 - EXECUTION

3.1 COMMON REQUIREMENTS FOR ELECTRONIC SECURITY INSTALLATION

A. Comply with NECA 1.

B. Measure indicated mounting heights to bottom of unit for suspended items and to center of unit for wall-mounting items.

C. Headroom Maintenance: If mounting heights or other location criteria are not indicated, arrange and install components and equipment to provide maximum possible headroom consistent with these requirements.

D. Equipment: Install to facilitate service, maintenance, and repair or replacement of components of both electronic safety and security equipment and other nearby installations. Connect in such a way as to facilitate future disconnecting with minimum interference with other items in the vicinity.

E. Right of Way: Give to piping systems installed at a required slope.

3.2 GENERAL

A. Install all system components and appurtenances in accordance with the manufacturer's instructions, ANSI C2, and furnish all necessary interconnections, services, and adjustments required for a complete and operable system as specified. Control signals, communications, and data transmission lines grounding shall be installed as necessary to preclude ground loops, noise, and surges from affecting system operation. Equipment, materials, installation, workmanship, inspection, and testing shall be in accordance with manufacturers' recommendations and as modified herein.

B. Consult the manufacturer's installation manuals for all wiring diagrams, schematics, physical equipment sizes, etc., before beginning system installation. Refer to the Riser/Connection diagram for all schematic system installation/termination/wiring data.

C. Firmly attach equipment to walls and ceiling/floor assemblies (e.g., sensors shall not be supported solely by suspended ceilings). Fasteners and supports shall be adequate to support the required load.

D. Current Site Conditions: Visit the site and verify site conditions are in agreement with the design package. Report all changes to the site or conditions that will affect performance of the system to the COTR as part of the Pre-Installation Submittal. Take no corrective action without written permission from the COTR.

3.3 SYSTEM PROGRAMMING

A. General

1. The following Loading Sheet submittals are required:

a. Shop Drawings – Pre-Installation Submittal
b. Final Construction Document Submittal – Closeout Submittal

2. Loading Sheets
   a. See the attached loading sheets. Refer to Section 1 regarding loading sheet submissions.
   b. System Configuration and Data Entry:
      1) The contractor is responsible for providing all system configuration and data entry for the SMS and subsystems (e.g., intercom, Inovonics wireless, digital video recorders, network video recorders). All data entry shall be performed to Smithsonian Institution's standards & guidelines. The Contractor is responsible for participating in all meetings with the OPS and the client to compile the information needed for data entry. These meetings shall be established at the beginning of the project and incorporated in to the project schedule as a milestone task. The contractor shall be responsible for all data collection, data entry, and system configuration. The contractor shall collect, enter, & program and/or configure the following components:
         a) Access control system components
         b) All intrusion detection system components
         c) Video surveillance, control and recording systems
         d) Intercom systems components
         e) All other security subsystems shown in the contract documents

3. Graphics
   a. Based on as-built drawings developed for the construction project, create all map sets and system icons showing locations of all alarms and field devices.
   b. Produce graphical maps of all alarm points installed under this contract including perimeter and exterior alarm points.
   c. Create and install all graphics needed to make the system operational.
   d. Utilize data from the contract documents, Contractor's field surveys, and all other pertinent information in the Contractor's possession to complete the graphics.
   e. Identify and request from the COTR and the PPSD Security Engineer, any additional data needed to provide a complete graphics package.
   f. Graphics shall have sufficient level of detail for the system operator to assess the alarm.
   g. Supply hard copy, color examples at least 8 x 10 in (203.2 x 254 mm) of each type of graphic to be used for the completed Security system. Deliver the graphics examples to the COTR and the PPSD Security Engineer for review and approval at least 90 calendar days prior to the scheduled date the Contractor requires them.

B. Alarm / Event Identification Format for Monitoring Station

1. Initial Descriptor
   a. The Initial Descriptor is a brief description of the event taking place and shall be no more than 50 characters in length. Contact OPS-PPSD for any Building ID, Area ID or Device / Condition Type not listed below.
   b. Building ID
      1) This is a two (2) or four (4) character identification of the building where the event is taking place. This shall follow the standard format as shown in the listing below. Confirm buildings and identifications with the owner.

Building	ID	Building	ID

Building	ID
African Art	AA
Air and Space	AS
American History	AH
American Indian (NY)	IN
American Indian Mall	IM
Anacostia	AN
Ancon (STRI)	AC
Apollo Drive	AD
Arts and Industries	AB
Barro Colorado (STRI)	BC
Bocas del Toro (STRI)	BT
Capital Gallery	CG
Columbia Warehouse	CW
Conference Center (STRI)	CC
Cooper Hewitt (NY)	CH
CRC (Suitland)	CR
Culebra (STRI)	CU
Dulles	DL
Engineering Building (STRI)	EB
Folk Life Festival	FF
Freer	FR
Galeta (STRI)	GA
Gamboa (STRI)	GM
Garber (Suitland)	GB
Herndon	HN

Building	ID
Hirshhorn	HH
Horticulture Greenhouse	HG
Library (STRI)	LB
Maintenance Shop (STRI)	TP
MSC (Suitland)	MS
NAOS (STRI)	NAOS
National Zoological Park	NZ
Natural History	NH
NMAAHC	AAHC
Patent Office Building	PB
Pennsy Drive	SISC
Postal Museum	PM
Quad	SQ
Renwick	RW
Research Branch (NY)	RB
Sackler	SK
SAO Arizona	AZ
SAO Hilo HI	HI
SAO Mauna Kea HI	MK
SCBI Front Royal VA	FZ
SERC	SR
SI Castle	SB
Tivoli Facility (STRI)	TV
Tupper Facility (STRI)	TP
Victor Building	VB

c. Monitor Point Location
   1) This is the monitor point physical location. There is no separation between the Building ID and the Monitor Point Location.
   2) Description of iStar:
      a) The Monitoring Point Location includes a two (2) character descriptor for the iStar Cluster, followed by a colon and then a two (2) character descriptor for the iStar panel followed by a colon then a one (1) character space.
      b) Next is the one (1) character descriptor for ACM # (1 or 2) ‘ACM:#’ followed by a one (1) character space.
      c) Next is the device connection location for where the device terminates using ‘I8’ for an I-8 module, ‘R8’ for an R-8 module, ‘RDR’ for a reader module, followed by a colon. Then a one (1) character number representing which module it is (i.e. the fourth I-8 module), followed by a colon. Last is a one (1) character number representing the input number on the module; the inputs on the ACM board require a two (2) character number.
   3) Example of iStar

a) xx01:01 ACM:1:i06 = iStar Cluster 01, iStar #01, ACM #1, main panel, sixth input
b) xx01:02 ACM:2 I8:3:i6 = iStar Cluster 01, iStar #02, ACM#2, I-8 module #3, sixth input
c) xx02:16 ACM:1 R8:2:o4 = iStar Cluster 02, iStar #16, ACM #1, R-8 module #2, fourth output
d) xx01:15 ACM:1 RDR:4:i2 = iStar Cluster 01, iStar #15, ACM#1, reader module #4, second input

d. Area ID (Type)
1) This is a brief description of the location of the alarm / event. There shall be a one (1) character space between the Monitor Point Location and the Area ID. At a minimum level of description, this shall follow the standard format as shown in the listing below. Confirm areas and identifications with the owner.

Description	Area ID
Vault	VAULT
Collection Storage	COLL STORAGE
Archive Areas	ARCHIVE
Collection Archive Areas	COLL ARCHIVE
Collection Processing / Preparation Areas	COLL PREP ROOM
Alcohol Storage Areas	ALCOHOL
Cold Collection Storage Areas	COLD STORAGE
Curatorial Areas	CURATORIAL
Exhibit Gallery (XX To be replaced with Gallery No.)	GALLERY XX
Exhibit Alarms Located in Lobbies or Reception Areas	LOBBY EXHIBIT
Exhibit or Artifact Alarms in “Other” Areas	MISC EXHIBIT
Registrar Areas	REGISTRAR
Perimeter Door, Glass Break, Motion	PERIMETER
Staff Cafeteria	STAFF CAFE
Public Access Cafeteria	PUBLIC CAFE
Public Staff Separation Door	STAFF DOOR
Museum Shop	MUSEUM SHOP
Museum Shop Storage Areas	MUSEUM SHOP ST
Cash Processing Areas	CASH ROOM
Automated Teller Machines	ATM
Executive Office Space	EXECUTIVE
Support Staff Office Space	STAFF OFFICE
Loading Dock Areas	LOADING DOCK
Security Unit Control Room	UNIT CONTROL
Security Wire Closet	WIRE CLOSET
Computer Center Rooms	COMPUTER ROOM
Mechanical Room	MECHANICAL

Description	Area ID
Electrical Room	ELECTRICAL
Communication Closet	COMM CLOSET
Fabrication Shop	FABRICATION
Support Staff Storage Area	STAFF STORAGE
Warehouse Storage Area	WAREHOUSE
Shipping and Receiving Area	SHIPPING
Security Officer Kiosks / Posts	SECURITY POST
Information Booths	INFO BOOTH
Locker Rooms	LOCKER ROOM
Laboratories	LABORATORIES
Libraries	LIBRARY
Liquor Storage Areas	LIQUOR STORAGE
Child Care Centers	CHILD CARE
Photo Processing Laboratories	PHOTO LAB
Animal Area for Public Viewing	ANIMAL EXHIBIT
Animal Area not for Public Viewing	ANIMAL OFF-
Outside Animal Area	ANIMAL YARD
Marine Animal Area	ANIMAL TANK
Animal/Keeper Area	KEEPER
Keeper (only) Area	KEEPER SPACE
Exterior Site Alarms	SITE

e. Device / Condition Type
   1) This is a two (2) digit descriptor for the type of device / condition that initiated the alarm / event. There is a one (1) character space between the Area ID and the Device / Condition Type. This follows the standard format as shown in the listing below. Confirm device / condition identifications with the owner.

Type of Device / Condition	ID
Door Contact	DC
Motion Detector	MD
Vibration Detector	VD
Glass Break Detector	GB
Hold Up / Duress Button	HU
Bill Trap (Last Bill Detector)	BT
Door Held Open	HO
Door Forced Open	FO
Power Failure	PF
Tamper Alarm	TP
Delayed Egress Pre Alarm	DE
Temperature Alarm	TA

Type of Device / Condition	ID
Window Contact	WC
Hazard Alarm	HZ
Case / Display Alarm	CA
Low / Missing Battery	LB
Communication Failure	CF
Security Fault	SF
UPS / Power Supply Trouble	PT
Restore / Reset	RS
Proximity Alarm	PA
Pressure Mat	PM
HVAC Duct Alarm	DA
Lock Secure	LS

Type of Device / Condition	ID
Shock Sensor	SS
Photo Beam	PB
Request to Exit	REX
Seismic Alarm	SA
Video Loss	VL
Supervision Error	SE

Type of Device / Condition	ID
Battery Fail	BF
Tamper Alarm	TP
Lock	LK
Door Status Monitor	DSM
Sounder	SD
Active Vehicle Barrier	VB

f. Examples for the Initial Descriptor:
   1) National Museum of Natural History monitor point location DGP chain 1 DGP number 2 first I-8 input 4, collection storage motion detector in alarm.
      a) NH01:02 I8:1:i4 COLL STORAGE MD
   2) Arts and Industries Building monitor point location DGP chain 3 DGP number 4 main panel input 6, public staff separation door contact.
      a) AB03:04 M:i6 STAFF DOOR DC

2. Secondary Descriptor
   a. The Secondary Descriptor is 128 characters
   b. This is an in-depth description for the location of the alarm / event taking place. If multiple devices are connected to the same monitor point the number of devices should be indicated.
   c. Examples for the secondary descriptor
      1) National Museum of Natural History monitor point location DGP chain 1, DGP number 6, I32 board input 31, collection storage motion detector in alarm.
         a) NH01:06 I32:i31 COLL STORAGE MD: NMNH 5th Fl East Wing Rm. 5210 Motion Detectors (3).
      2) Arts and Industries Building monitor point location DGP chain 1, DGP number 2 third I-8 board input 5, public staff separation door forced open.
         a) AB01:02 I8:3:i5 STAFF DOOR FO: AIB 1st Fl East Hall Card Access Door Forced Open.
   d. Linked Instruction Event
      1) This is a full instructional description for the processing of the alarm / event and follows the standard format of:
         a) Repeat 50 character descriptor
         b) In-depth description of location
         c) Response instructions
         d) Logging instructions
         e) Reset instructions
         f) Nearest camera location (If multiple views are available list all)
         g) DGP input is connected to
   e. Examples for the linked instructional event
      1) National Museum of Natural History monitor point location DGP chain 1 DGP number 3, I32 board input 31, collection storage motion detector in alarm.

Step	Display
1	NH01:03 I32:i31 COLL STORAGE MD
2	5th fl east wing Rm. 5210 motion detectors (3)

Step	Display
3	Dispatch officer to investigate and report findings
4	Log officer's name and actions into computer log
5	Device resets automatically when motion has stopped
6	Nearest camera is No. (camera Nos. provides other views)
7	Device connected to DGP

A. Alarm / Event Mapping Requirements

1. General
   a. All maps associated with alarm / event call-ups shall be a black foreground on a white background.
2. Map Information Screen
   a. The map information screen shall provide access to three different map levels for each event
   b. Building Floor Map
      1) This map has the quadrant where the event is taking place line colored blue or the colored event icon in place. Identify this map with the building name and floor at the bottom of the map.
   c. Quadrant Map
      1) This is the map called up by the system automatically upon event activation. Identify this map with the building name, floor number, and quadrant at the bottom of the map. This map has the icon representing the event shown upon call up. Clicking on the icon or a map "zoom in" icon at this map level calls up the Area map.
   d. Area Map
      1) This map represents the local area of the building where the event is taking place. This map contains all icons associated with this area. These icons are "living", changing colors as the associated devices change state. Identify this map with the building name, floor number, quadrant, and area name at the bottom of the map.
3. Mapping icons
   a. Mapping icons are "living" changing color as the associated devices change state.
      1) Red = alarm / activated state
      2) Green = secure / normal state
      3) Yellow = masked, shunted, accessed, etc. state
   b. Group and position mapping icons represented on the Area map as follows:
      1) Motion detectors providing back up to perimeter door(s) / window(s).
         a) Place a single icon in a close geographical position to the protected door(s) or window(s), to represent all devices in the zone or group
      2) Motion detectors providing back up to public staff separation doors and other internal doors.
         a) Place a single icon in a close geographical position to the protected door.
      3) Motion detectors providing volumetric protection of a room.
         a) Place a single icon in the center of the room, to represent all devices in the zone or group
      4) Glass break detectors protecting perimeter windows

a) Place a single icon in a close geographical position to the center of the window or group of windows, to represent all devices in the zone or group

5) Door contacts protecting individual perimeter doors or logical groups of perimeter doors.
   a) Place a single icon in a close geographical position to the center of the door or group of doors, to represent all devices in the zone or group
6) Delayed egress pre alarm contacts protecting individual doors or logical groups of doors.
   a) Place a single icon in a close geographical position to the center of the door or group of doors, to represent all devices in the zone or group.
7) Window contacts protecting individual perimeter windows or logical groups of perimeter windows.
   a) Place a single icon in a close geographical position to the center of the window or group of windows, to represent all devices in the zone or group.
8) Card reader events to include door forced open and door held open alarms.
   a) A single icon shall be the same as the door contact protecting the door.
   b) Icon descriptor shall identify the appropriate event taking place.
9) Tamper alarms protecting panels in security closets.
   a) Place a single icon in the center of the room, to represent all devices in the zone or group.
10) Tamper alarms protecting individual devices or logical groups of devices.
   a) Place a single icon in close geographical position to the device or group of devices, to represent all devices in the zone or group.
11) Exhibit level case/display alarms.
   a) A single icon shall represent all devices protecting the case/display.
   b) Place icon directly over the case/display so the case outline is still visible below (around) the icon
   c) Icon descriptor shall identify the appropriate device in alarm.
12) Vibration detectors protecting any physical barrier or point of entry.
   a) Place a single icon in close geographical position to the physical barrier / point of entry or group of devices, to represent all devices in the zone or group.

B. System Programming

1. General Programming Requirements
   a. Use the following section to identify the anticipated level of effort (LoE) required setup, program, and configuring the ESS.
   b. Provide all setup, configuration, and programming to include data entry for the SMS and subsystems (e.g., video system, intercoms, digital video recorders, intrusion devices, maps and icons, time synchronization, including integration of subsystems to the SMS.
2. Configuration Management of Servers
   a. Provide SI-OPS the security system servers for baseline configuration 90 days before system programing begins.

b. Once the security system server is baselined according to SI-OCIO requirements the server will be returned to the security contractor for system programing.
c. There are other programming requirements the contractor needs assistance on as follows:
    1) OPS has to enter the Levels and Permissions of programing
    2) Synchronize system with C-Cure Central
    3) Employee card reader data will be automatically entered in the system server
    4) OPS will enter Card reader Clearances

3. Level of Effort for Programming
    a. Perform and complete system programming (including all data entry) at an offsite location using the Contractor's own copy of the C*Cure 9000 software which must be the same version SI is using.
    b. Deliver the completed forms (loading sheets) to the COTR and PPSD Security Engineer for review and approval at least 90 calendar days prior to the scheduled date the Contractor requires it.
    c. Once system programming has been completed, deliver the programming to the COTR and the PPSD Security engineer on data entry forms (loading sheets) and an approved electronic medium.
    d. System programming may not be uploaded until the COTR and the PPSD security Engineer provide written approval.
    e. The Contractor is responsible for backing up the system prior to uploading new programming data.
    f. Additional programming requirements are provided as follows.
        1) Programming for New SMS Server
            a) Provide all other system related programming.
            b) Upload personnel information (e.g., ID Cards backgrounds, names, access privileges, personnel photos, access schedules, personnel groupings)
            c) Coordinate with OPS for device configurations, standards, and groupings. SI shall provide database to support Contractor's data entry tasks.
            d) Conduct a weekly coordination meeting and work alongside OPS to ensure data uploading is performed without incident of loss of function or data loss.
        2) Programming for Existing SMS Servers
            a) Perform all related system programming except for personnel data as noted.
            b) The contractor is not responsible for uploading personnel information (e.g., ID Cards backgrounds, names, access privileges, access schedules, personnel groupings).
            c) Conduct a weekly coordination meeting and work alongside OPS to ensure data uploading is performed without incident of loss of function or data loss.
            d) Perform system programming for SMS servers using the Contractor's own server and software. These servers shall not be connected to existing devices or systems at any time.
    g. Identify any additional data needed to provide a complete and operational system as described in the contract documents and request the information from the COTR and the PPSD Security Engineer.

h. Programming effort requires a high level of coordination between Contractor and OPS to ensure programming is performed in accordance with SI requirements and programming uploads do not disrupt existing systems functionality.
   1) Conduct a weekly coordination meeting and work alongside OPS to ensure data uploading is performed without incident of loss of function or data loss.

i. Ensure data uploading is performed without incident or loss of function or data loss.

j. The following Level of Effort Chart is provided to communicate the expected level of effort required by contractors on SI ESS projects. Determine actual levels of effort prior to bidding on the project.

SMS Setup & Configuration

Description of Tasks	Develop System Loading Sheets	e.g., program monitoring stations, programming networks, interconnections between CCTV, intercoms, time synchronization
	Coordination	e.g., retrieve IP addresses, naming conventions, standard event descriptions, programming templates, coordinate special system needs
	Initial Set-up Configuration	e.g., Load system Operating System and Application software, general system configurations
	Graphic Maps	e.g., develop naming conventions, develop file folders, confirming accuracy of AutoCAD Floor Plans, convert file into jpeg file then to bitmap.bmp file
	System Programming	e.g., program monitoring stations, programming networks, interconnections between CCTV, intercoms, time synchronization
	Final Checks	e.g., check all system diagnostics (e.g., clients, panels)
	Level of Effort (Typical Tasks)	Load and set-up 4-6 CDs and configure servers (to configure Loading and Configuring software Administrative account, audit log Keystrokes, mouse clicks, multi-screen configuration

Electronic Entry Control Systems

Description of Tasks	Develop System Loading Sheets	e.g., setup of device, door groups & schedules, REX, Locks, link graphics
	Coordination	e.g., confirming device configurations, naming conventions, event description and narratives
	Initial Set-up Configuration	e.g., enter data from loading sheets; configure components, link events, cameras, and graphics
	Graphic Maps	e.g., develop naming conventions, develop file folders, confirming accuracy of AutoCAD Floor Plans, convert file into jpeg file then to bitmap.bmp file
	System Programming	e.g., setup of device, door groups & schedules, REX, Locks, link graphics
	Final Checks	e.g., performing entry testing to confirm correct set-up and configuration
	Level of Effort (Typical Tasks)	e.g., creating a door, door configuration, adding request to exit, door monitors and relays, door timers, door related events (e.g., access, access denied, forced open, held open), linkages, controlled areas, advanced door monitoring, time zones, sequence of operations

Intrusion Detection Systems

Description of Tasks	Develop System Loading Sheets	e.g., enter door groups & schedules, link devices - REX, lock, & graphics
	Coordination	e.g., confirming device configurations, naming conventions, event description and narratives
	Initial Set-up Configuration	e.g., enter data from loading sheets; configure components, link events, cameras, and graphics
	Graphic Maps	e.g., develop naming conventions, develop file folders, confirming accuracy of AutoCAD Floor Plans, convert file into jpeg file then to bitmap.bmp file
	System Programming	e.g., enter door groups & schedules, link devices - REX, lock, & graphics
	Final Checks	e.g., walk test, device position, and masking
	Level of Effort (Typical Tasks)	e.g., setting up monitoring and control points (e.g., motion sensors, glass breaks, vibration sensor, strobes, sounders) creating intrusion zones, creating arm/disarm panel, timed sequences, time zones, icon placements on graphic maps, clearance levels, events (e.g., armed, disarmed, zone violation, device alarm activations), LCD reader messages,

CCTV Systems

Description of Tasks	Develop System Loading Sheets	e.g., programming call-ups recording
	Coordination	e.g., confirming device configurations, naming conventions
	Initial Set-up Configuration	e.g., enter data from loading sheets; camera naming convention, sequences, configure components)
	Graphic Maps	e.g., develop naming conventions, develop file folders, confirming accuracy of AutoCAD Floor Plans, convert file into jpeg file then to bitmap.bmp file
	System Programming	e.g., programming call-ups recording
	Final Checks	e.g., confirm area of coverage, call-up per event generated and recording rates
	Level of Effort (Typical Tasks)	e.g., setting up cameras points, recording ratios (e.g., normal, alarm event) timed recording, linkages, maps placements, call-ups

Intercoms Systems

Description of Tasks	Develop System Loading Sheets	e.g., programming events & call-ups
	Coordination	e.g., confirming device configurations, naming conventions, event description and narratives
	Initial Set-up Configuration	e.g., enter data from loading sheets; configure components, link events, cameras, and graphics
	Graphic Maps	e.g., develop naming conventions, develop file folders, confirming accuracy of AutoCAD Floor Plans, convert file into jpeg file then to bitmap.bmp file
	System Programming	e.g., programming events & call-ups
	Final Checks	e.g., confirm operation, SMS event generation and camera call-up
	Level of Effort (Typical Tasks)	e.g., setup linkages, events for activations, device troubles, land devices on graphic maps

Console Monitoring Components

Description of Tasks	Develop System Loading Sheets	N/A
	Coordination	per monitor
	Initial Set-up Configuration	per monitor
	Graphic Maps	e.g., develop naming conventions, develop file folders, confirming accuracy of AutoCAD Floor Plans, convert file into jpeg file then to bitmap.bmp file
	System Programming	N/A
	Final Checks	per monitor
	Level of Effort (Typical Tasks)	N/A

Note: Programming tasks are supported through the contractor's development of the Submittals.

END OF SECTION 280500.10

SECTION 280507.10 – POWER SOURCES FOR ELECTRONIC SECURITY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

B. Section 280500.10 Common Work Results for Electronic Security.

1.2 SYSTEM DESCRIPTION

A. The power sources support the electronic security systems (ESS).

B. Electrical Power

1. Provide an automatic transfer switch for switching between primary and generator power.

C. Uninterruptible Power Supply (UPS)

1. The switch from primary power to generator shall generate an AC Fail alarm on the Physical Access Control System (PACS).
2. Provide an interface (dry contact closure) between the PACS and the UPS system so the UPS trouble signals and main power fail appear on the PACS operator terminal as alarms.
3. UPS for security equipment shall have the capacity to provide one (1) hour of service.
4. All UPS for security equipment must have 20% extra capacity for future expansion.
5. Dedicated UPS units shall not be floor mounted unless in the UCR. All other UPS units shall be rack mounted.

D. Power Supplies

1. The switch from primary power to generator shall generate an AC Fail alarm on the PACS.
2. Detect and report on the PACS failure of any battery as a fault condition.
3. Size battery backed-up power supplies for eight (8) hours of operation at actual connected load.
4. All power supplies for security equipment must have 20% extra capacity for future expansion.

1.3 SUMMARY

A. This Section includes the following:
1. UPS

1.4 REFER TO 280500.10 FOR ALL OTHER PART I REQUIREMENTS

PART 2 - PRODUCTS

2.1 UNINTERRUPTIBLE POWER SUPPLY

A. Acceptable Manufacturers

1. APC

B. APC Smart-UPS Ultra SRTL3KRM1UNC or approved equivalent

C. Minimum Required Features and Specifications

1. Pre-Installed Network Management Card
2. One (1) rack unit high
3. Lithium Ion Battery
4. 2,850 W / 2,880 VA
5. Five (5) NEMA 5-20R, One (1) NEMA L5-30R Output Connections
6. Depth is 22.05 in (560 mm)
7. 5 years repair or replace warranty

PART 3 - EXECUTION

3.1 GROUNDING

A. Comply with requirements in Section 270526.10 "Grounding and Bonding for Security Systems" for grounding conductors and connectors.

3.2 REFER TO 280500.10 FOR ALL OTHER PART III REQUIREMENTS

END OF SECTION 280507.10

SECTION 280513.10 – SERVERS, WORKSTATIONS, AND STORAGE FOR ELECTRONIC SECURITY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

B. Section 280500.10 Common Work Results for Electronic Security.

1.2 SYSTEM DESCRIPTION

A. This specification is for the servers, workstations, and storage directly supporting the electronic security systems (ESS) including all software licenses.

1.3 SUMMARY

A. This Section includes the following:

1. NVR’s

1.4 REFER TO 280500.10 FOR ALL OTHER PART I REQUIREMENTS

PART 2 - PRODUCTS

2.1 NETWORK VIDEO RECORDER

A. Acceptable Manufacturers

1. American Dynamics

B. ADVER200R6DK or approved equivalent

C. Minimum Required Features and Specifications

1. OS Drive: Redundant 480GB SSD SATA (RAID 1)
2. Network Interface: 2 x 10 Gigabit Ethernet NICs; 2 x 1 Gigabit Ethernet NICs
3. 200 TB RAID 6 Video Storage
4. iSCSI External Storage
5. Dual 800 W Power Supply
6. 1500 Mbps Video Recording Throughput

PART 3 - EXECUTION

3.1 GROUNDING

A. Comply with requirements in Section 270526.10 "Grounding and Bonding for Security Systems" for grounding conductors and connectors.

3.2 REFER TO 280500.10 FOR ALL OTHER PART III REQUIREMENTS

END OF SECTION 280513.10

SECTION 280531.10 – COMMUNICATIONS EQUIPMENT FOR ELECTRONIC SECURITY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

B. Section 280500.10 Common Work Results for Electronic Security.

1.2 SYSTEM DESCRIPTION

A. This specification is for the communications equipment directly supporting the electronic security systems (ESS).

1.3 SUMMARY

A. This Section includes the following:
   1. Network Access Switches
   2. Environmentally Hardened Network Switches

1.4 REFER TO 280500.10 FOR ALL OTHER PART I REQUIREMENTS

PART 2 - PRODUCTS

2.1 NETWORK ACCESS SWITCH – 48 PORT

A. Acceptable Manufacturers

1. Cisco

B. Cisco 9300 series C9300-48U with C9300-NM-8X or approved equivalent

C. Minimum Required Features and Specifications

1. Forty-eight (48) 10/100/1000 UPOE ports
2. Two (2) 10 Gigabit Ethernet SFP+ ports
3. Four (4) SFP+ modules rated for 400M over MM OM4 cable
4. Redundant 1100W power supplies
5. Switching capacity of 256 Gbps
6. 480 Gbps stacking bandwidth
7. Eight (8) GB of DRAM
8. Eight (16) GB Flash
9. MTBF of 277,770 hours
10. Stacking cable
11. Power stacking cable
12. 24/7/365 hardware and software support from OEM with 4-hour onsite parts.

D. Required Options / Parts

1. C9300-NM-8X
2. Four (4) Cisco SFP-10G-SR per access switch (two for the access switch and one for each core switch)
3. MultiMode OM4 patch cords

2.2 NETWORK ACCESS SWITCH – 24 PORT

A. Acceptable Manufacturers

1. Cisco

B. Cisco 9300 series C9300-24U with C9300-NM-8X or approved equivalent

C. Minimum Required Features and Specifications

1. Twenty-four (24) 10/100/1000 copper UPOE ports
2. Two (2) 10 Gigabit Ethernet SFP+ ports
3. Four (4) SFP+ modules rated for 400M over MM OM4 cable
4. Redundant 1100W power supplies
5. Switching capacity of 256 Gbps
6. 480 Gbps stacking bandwidth
7. Eight (8) GB of DRAM

8. Eight (16) GB Flash
9. MTBF of 299,000 hours
10. Stacking cable
11. Power stacking cable
12. 24/7/365 hardware and software support from OEM with 4-hour onsite parts.

D. Required Options / Parts

1. C9300-NM-8X
2. Four (4) Cisco SFP-10G-SR per access switch (two for the access switch and one for each core switch)
3. MultiMode OM4 patch cords

2.3 RUGGED 8-PORT NETWORK SWITCH

A. Acceptable Manufacturers

1. Cisco
2. Approved Equivalent

B. Cisco IE-3200-8P2S-E or approved equivalent

C. Minimum Required Features and Specifications

1. Rugged Series Network Switch
2. Eight (8) 10/100/1000 RJ45 Copper ports
3. Two (2) 100/1000 SFP ports
4. PoE Budget: 240W
5. Dual DC power inputs
6. DIN rail mounting
7. Power consumption: 32W

D. Required Options / Parts

1. Cisco UPS System with Cisco IE-3200-8P2S-E (Model #: VP-148D1-07132-0)
2. MultiMode OM4 patch cords

PART 3 - EXECUTION

3.1 GROUNDING

A. Comply with requirements in Section 270526.10 "Grounding and Bonding for Security Systems" for grounding conductors and connectors.

3.2 IP ADDRESSING

A. Refer to 280500.10 Submittals for requirements.

3.3 REFER TO 280500.10 FOR ALL OTHER PART III REQUIREMENTS

END OF SECTION 280531.10

SECTION 280800.10 – COMMISSIONING OF ELECTRONIC SECURITY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

B. Section 280500.10 Common Work Results for Electronic Security.

1.2 SYSTEM DESCRIPTION

A. This specification is for the commissioning of electronic security systems (ESS).

1.3 SUMMARY

A. This Section includes the following:
   1. Commissioning of the Electronic Security Systems

1.4 REFER TO 280500.10 FOR ALL OTHER PART I REQUIREMENTS

PART 2 - PRODUCTS

2.1 THERE ARE NO PRODUCTS IN THIS SPECIFICATION

PART 3 - EXECUTION

3.1 PERFORMANCE REQUIREMENTS

A. General

1. Refer to Project Process Diagram (PPD) in 280500.10. Utilize the PPD to develop effective and timely project schedules and submissions to ensure project is substantially complete prior to occupancy.

3.2 CONTRACTOR'S FIELD TESTING

A. Perform the Contractor Field Test (CFT) of all devices utilizing OPS provided forms.

B. Submit test results, including journal logs from CCURE, to COTR and OPS-PPSD.

3.3 PERFORMANCE VERIFICATION TEST (PVT)

A. Based on the OPS-PPSD approval of the Contractor's Field Test, the COTR will schedule the PVT with the Contractor and OPS-PPSD.

B. OPS-PPSD will witness the Contractor conduct the PVT of all devices utilizing the same form as for the CFT.

C. OPS-PPSD reserves the right to stop and abort testing as soon as 10 technical deficiencies are found requiring correction.

1. If the acceptance test is aborted, the re-test will commence from the beginning with a retest of components previously tested and accepted.
2. The Contractor is responsible for all time, travel, and lodging expenses incurred for personnel required to be present for resumption of the PVT.

D. The PVT also includes a physical inspection of the installation quality and workmanship.

E. Submit test results, including journal logs from CCURE, to COTR and OPS-PPSD.

3.4 REFER TO 280500.10 FOR ALL OTHER PART III REQUIREMENTS

END OF SECTION 280800.10

SECTION 281000 – ACCESS CONTROL

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

B. Section 280500.10 Common Work Results for Electronic Security.

1.2 SYSTEM DESCRIPTION

A. The physical access control system (PACS) is an enterprise class system with intrusion detection inherent to the PACS controllers. The PACS is the central system for the entire electronic security system. Integrate all other systems (intrusion detection, intercommunications, and video) with the PACS so the PACS provides a single unified control and management platform.

B. This is an extension of the Owner's existing Software House C•CURE 9000 system.

1.3 SUMMARY

A. This Section includes the following:

1. PACS Software
2. PACS Panels
3. Input/Output Modules
4. Door Control Module with Enclosure
5. Card Readers

1.4 REFER TO 280500.10 FOR ALL OTHER PART I REQUIREMENTS

PART 2 - PRODUCTS

2.1 PACS SOFTWARE

A. Software Licensing

1. The existing Software House PACS license will support this project.

B. Software Integrations

1. Video Assessment and Surveillance System (VASS) functionality
   a. Control of cameras through the PACS and graphic maps
   b. Associate cameras with access control and alarm events
2. Intercom functionality
   a. Control of intercoms through the PACS and graphic maps
   b. Associate cameras with intercom calls

2.2 ISTAR EDGE G2

A. Acceptable Manufacturers

1. Software House

B. GSTAR004-POE

C. Minimum Required Features and specifications

1. Localized access control with storage for over 1,000,000 personnel records
2. AES 256 symmetric encryption
3. Jumper-selectable 12 or 24VDC for lock power
4. Power over Ethernet (PoE) Plus Module
5. Supports four readers
6. (4) supervised inputs per reader
7. (2) Outputs per reader
8. UL294 and UL1076

2.3 INPUT/OUTPUT MODULES

A. Acceptable Manufacturers

1. Software House

B. Provide Software House OSDP I8 input module(s) and OSDP R8 output module(s) as needed for system expansion or integration

C. Minimum Features and specifications

1. Provides expansion of input and output capacity
2. Works in RM mode and OSDP mode

3. Compatible with a full range of Software House Istar access control panels
4. OSDP-I8 provides (8) eight Class A supervised inputs
5. OSDP-R8 provides (8) eight Form C relay outputs
6. Dedicated tamper input included on each module
7. Includes a built-in RS-485 end-of-line termination switch

2.4 DOOR CONTROL MODULE WITH ENCLOSURE

A. Acceptable Manufacturers

1. Software House

B. Software House G2-RM-DCM-2 or approved equivalent

C. Minimum Features and specifications

1. G2-RM-DCM-2 UL Listed tamper protected enclosure
2. G2-RM-4E module. Works in RM mode and OSDP mode
3. Temperature range: 32 to 122 deg F (0 to 50 deg C)
4. Power Requirements: 12VDC 480mA max or 24VDC 260mA max
5. Communication: RS485 half-duplex, OSDP or RM protocol

2.5 CARD READER, STANDARD

A. Acceptable Manufacturers

1. Identiv
2. HID
3. Approved Equivalent

B. The following readers are tested and acceptable

1. Identiv 8110ABPOYLT-TS449 Standard (Pigtail)
2. Identiv 811OABTOYLT-TS449 Standard (Terminal Plug)
3. HID SCR-SIG-40NK-SM (Pigtail)
4. HID SCR-SIG-40TNK-SM (terminal Plug)

C. Minimum Features and specifications

1. Works with C•CURE 9000
2. Read within 3 inches
3. Standard firmware that allows field programming no matter the model
4. Single-gang mounting
5. Black
6. Environmental
   a. IP65 Pigtail models
   b. IP55 Terminal models
   c. Temperature range: -31 to 149 deg F (-35 to 66 deg C)
7. Terminal strip is preferred

8. Low Frequency Card Compatibility (125 kHz)
   a. Indala
9. High Frequency Card Compatibility (13.56 MHz)
   a. PIV
   b. PIV-I
   c. Mi-Fare Classic
   d. DESFire EV1
   e. PLAID
   f. ISO 15693
   g. ISO 14443A/B

2.6 CARD READER, ARM/DISARM

A. Acceptable Manufacturers

1. Software House
2. Approved Equivalent

B. SWH TST-100 Touchscreen Terminal with LCD display and keypad

C. Minimum Features and specifications

1. Works with C•CURE 9000
2. 4.3” diagonal capacitive touchscreen
3. Voltage input: 12VDC +/- 20%
4. Current draw: 180mA nominal, 300mA max
5. Encrypted RS-485 communications
6. Read range from 1” to 2.5”
7. Two (2) supervised inputs
8. Two (2) outputs (Form A)
9. Easy firmware download
10. Black
11. Environmental
    a. Temperature range: -4 to 140 deg F (-20 to 60 deg C)
12. Low Frequency Card Compatibility (125 kHz)
    a. HID
13. High Frequency Card Compatibility (13.56 MHz)
    a. iCLASS PACS data
    b. iCLASS SE PACS data
    c. iCLASS Seos PACS data
    d. MIFARE CSN
    e. DESFire EV1 and EV2 CSN

PART 3 - EXECUTION

3.1 GROUNDING

A. Comply with requirements in Section 270526.10 "Grounding and Bonding for Security Systems" for grounding conductors and connectors.

3.2 GENERAL

A. Install all system components and appurtenances in accordance with the manufacturers' instructions, ANSI C2, and furnish all necessary interconnections, services, and adjustments required for a complete and operable system as specified. Install control signals, communications, and data transmission lines grounding as necessary to preclude ground loops, noise, and surges from affecting system operation. Equipment, materials, installation, workmanship, inspection, and testing shall be in accordance with manufacturers' recommendations and as modified herein.

B. Consult the manufacturers' installation manuals for all wiring diagrams, schematics, physical equipment sizes, etc., before beginning system installation. Refer to the Riser/Connection diagram for schematic system installation/termination/wiring data.

C. Attach equipment to walls and ceiling/floor assemblies and held firmly in place (e.g., sensors shall not be supported solely by suspended ceilings). Fasteners and supports shall be adequate to support the required load.

3.3 PREPARATION

A. Comply with recommendations in SIA CP-01.

B. Comply with EIA/TIA-606, "Administration Standard for the Telecommunications Infrastructure of Commercial Buildings."

3.4 CURRENT SITE CONDITIONS

A. Visit the site and verify site conditions are in agreement with the design package. Report changes to the site or conditions which will affect performance of the system to the COTR and PPSD-Security System Engineer in a report. The Contractor shall not take any corrective action without written permission from the COTR.

3.5 EXAMINATION

A. Examine pathway elements intended for cables. Check raceways, cable trays, and other elements for compliance with space allocations, installation tolerances, hazards to cable installation, and other conditions affecting installation.

B. Examine roughing-in for LAN and control cable conduit systems to PCs, Controllers, card readers, and other cable-connected devices to verify actual locations of conduit and back boxes before device installation.

C. Proceed with installation only after correcting unsatisfactory conditions.

3.6 ELEVATOR TRANSITION BOX

A. Provide a 12 x 12 in (305 x 305 mm) NEMA 4 enclosure in the Elevator Equipment Room. This is a transition point between Division 14 cabling and Division 28 cabling.

3.7 REFER TO 280500.10 FOR ALL OTHER PART III REQUIREMENTS

END OF SECTION 281000

SECTION 281515 – ELECTRIFIED LOCKING DEVICES AND ACCESSORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

B. Section 280500.10 Common Work Results for Electronic Security.

1.2 SYSTEM DESCRIPTION

A. This specification is electrified locking devices and accessories in support of the PACS directly supporting the electronic security systems (ESS). All locking and access control must comply with NFPA 101. Coordinate with Division 8 requirements.

1.3 SUMMARY

A. This Section includes the following:

1. Passive Infrared Request to Exit (PIR Rex)
2. Sounders
3. Electrified Locks
4. Electric Strikes
5. Electric Hinges
6. Electronic Pass-through Hinges

1.4 REFER TO 280500.10 FOR ALL OTHER PART I REQUIREMENTS

PART 2 - PRODUCTS

2.1 PIR REQUEST TO EXIT

A. Acceptable Manufacturers

1. Bosch Security Systems
2. Approved Equivalent

B. DS160 or DS161 or approved equivalent.

C. Minimum Features and Specifications

1. Passive infrared sensor designed for wall or ceiling mounting 7.5 to 15 ft (2.1 to 4.6 m)
2. Provide two (2) form “C” (SPDT) relays rated one (1) Amp. @ 30 VDC for DC resistive loads
3. The detectors relays shall be user adjustable with a latch time from 0.5-64 seconds. The detector shall also include a selectable relay reset mode to follow the timer or absence of motion.
4. Adjustable detection pattern plus or minus fourteen (± 14) degrees
5. Operate on 12 VDC with approximately 39 mA continuous current draw
6. Measure approximately 1.8 x 6.75 x 1.75 in (45 x 171 x 44 mm)

2.2 LOCAL SOUNDER

A. Acceptable Manufacturers

1. Mallory
2. Approved Equivalent

B. SC616N and SC616CP or approved equivalent.

C. Minimum Features and Specifications

1. Local alarms shall be provided for all perimeter doors and card access controlled doors. All card access controlled doors receive local sounders. The local perimeter door alarms shall be a steady tone (SC 616N) while the card access controlled doors shall have a chime tone (SC 616CP).
2. The local sounder shall be a solid state sounding device with no moving parts. The sounder shall operate on 6-16 VDC at less than 16mA draw and produce a 2900 Hz signal at approximately 80-95 dB dependent upon input power. Sounders shall be powered by the auxiliary power supply. The power circuits supplying power to local sounders shall have an individual fuse for each positive leg between the main power supply output and individual distribution circuit. The fuse shall be rated at 50% of the rating of the fuse protecting the power supply output. The sounder shall be plate mounted to a recessed mounted junction box above and immediately adjacent the protected opening. Where the door is controlled by a card reader, the local sounder may be located on the reader module junction box providing the box is located immediately adjacent the protected opening and not obscured by ceiling tiles. The sounder shall be

located on the secure side of the protected opening. The sounding device shall be activated and reset via the security management system. Each sounder shall be controlled by an individual relay at the DGP or at field relay modules. Reset or silencing of the sounder shall be via the control room operator terminals.

2.3 ELECTRIFIED MORTISE LOCKSET WITH INTEGRATED REX

A. Acceptable Manufacturers

1. Sargent
2. Schlage
3. Yale
4. Approved Equivalent

B. Sargent Ecoflex 8200 or approved equivalent.

C. Minimum Features and Specifications

1. ANSI/BHMA certified extra heavy duty, lever type mortise lock conforming to ANSI/BHMA 156.13 Series 1000, Grade 1 requirements and ANSI A117.1 accessibility guidelines. All functions manufactured in a single sized case formed from a minimum 12 gauge steel.
2. Lockset is field-adjustable for handing without opening the lock body with a beveled armored front that is 0.125 in (3.175 mm) minimum thickness and utilizes a one-piece 3/4" anti-friction stainless steel latchbolt. To insure proper alignment, all trim, shall be thru-bolted and fully interchangeable between rose and escutcheon designs.
3. Lock is UL listed and labeled for use on up to 3 hour fire rated openings.
4. Locking and unlocking of the lever handle by electronic operation contained completely within the body of the mortise lock.
5. Field configurable Fail Safe /Fail Secure by means of an external DIP switch setting.
6. Operationally voltage-insensitive 12 to 24 VDC.
7. Energy Performance: Maximum standby current required for functional operation not to exceed 50 mA at 24 VDC limiting potential inductive kickback or the need for external diodes.
8. Valid egress signaled by activation of the Request-to-Exit (RX) micro switch integral to the inside lever of the lockset on the secure side of the door capable of shunting external alarms.
9. Compatible with Schlage lever handles
10. 2 year limited warranty on electrified locks

2.4 ELECTRIC STRIKE

A. Acceptable Manufacturers

1. HES
2. Approved Equivalent

B. 1006 series or approved equivalent.

C. Minimum Features and Specifications

1. UL 10C fire-rated, 3 hour single door (fail secure only)
2. UL 10C fire-rated, 1-1/2 hour double door (fail secure only)
3. ANSI A250.13-2003 windstorm listed
4. UL 1034 burglary-resistant listed and suitable for outdoor use
5. ANSI/BHMA A156.31, Grade 1
6. NFPA-252 fire door conformant
7. ASTM-E152 fire door conformant
8. Capable of use on metal and wood frames
9. Dual voltage 12 or 24VDC continuous duty
10. 0.45 Amps @ 12VDC* continuous duty
11. 0.25 Amps @ 24VDC* continuous duty
12. Stainless steel construction
13. Tamper resistant
14. Static strength 3070 lbs. (1,393 kg) (fail secure)
15. Dynamic strength 350 ft-lbs. (475 N m) (fail secure)
16. Endurance 1,000,000 cycles
17. Fail secure (standard)
18. Non-handed
19. Internally mounted solenoid
20. Accommodates up to 1 in (25.4 mm) deadbolt
21. Plug-in connector
22. Full keeper shims for horizontal adjustment
23. Trim enhancer
24. Five year limited warranty

2.5 ELECTRIC STRIKE, PANIC HARDWARE

A. Acceptable Manufacturers

1. HES
2. Approved Equivalent

B. 9400 series or approved equivalent.

C. Minimum Features and Specifications

1. ANSI/BHMA A156.31, Grade 1
2. Capable of use on metal and wood frames
3. Dual voltage 12 or 24VDC continuous duty
4. 0.45 Amps @ 12VDC* continuous duty
5. 0.25 Amps @ 24VDC* continuous duty
6. Completely surface mounted
7. Stainless steel construction
8. Tamper resistant
9. Static strength 1,500 lbs. (680 kg)
10. Dynamic strength 70 ft-lbs. (95 N m)
11. Endurance 500,000 cycles
12. Included 0.125 in (3.175 mm) spacer plate

13. Field selectable fail safe/fail secure
14. Horizontal adjustment
15. Non-handed
16. Internally mounted solenoid
17. Accommodates up to 0. 5 in (12.7 mm) Pullman latch
18. Five year limited warranty

2.6 ELECTRIC HINGE

A. Acceptable Manufacturers

1. SDC
2. Approved Equivalent

B. PTH Series or approved equivalent

C. Minimum Features and Specifications

1. Ten (10) conductor hinge
2. Standard weight, 5 knuckle hinge
3. 5’ cable
4. Finish: 626 Dull chrome

2.7 ELECTRONIC PASS-THROUGH HINGE

A. Acceptable Manufacturers

1. Allegion
2. Approved Equivalent

B. EPT-10 or approved equivalent

C. Minimum Features and Specifications

1. Ten (10) 24 gauge wires, up to 1A @ 24VDC, with a 16A maximum surge
2. Finishes: SP28 (sprayed aluminum & SP313 (sprayed duranodic)
3. UL listed for use on fire doors

PART 3 - EXECUTION

3.1 GROUNDING

A. Comply with requirements in Section 270526.10 "Grounding and Bonding for Security Systems" for grounding conductors and connectors.

3.2 GENERAL

A. Coordinate with Division 8 requirements, finishes, and keyways.

B. OPS Lock Shop will rekey project provided cores. Coordinate with the OPS Lock Shop to purchase correct cylinder/cores.

C. Only Software House certified integrators may terminate cabling on PACS equipment.

3.3 REFER TO 280500.10 AND 281000 FOR ALL OTHER PART III REQUIREMENTS

END OF SECTION 280515

SECTION 281523 – INTERCOM ENTRY SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

B. Section 280500.10 Common Work Results for Electronic Security.

1.2 SYSTEM DESCRIPTION

A. The Intercom system is an enterprise class system. Integrate with the Physical Access Control System (PACS) so the PACS provides a single unified control and management platform. Link calls to video system for event driven camera call-up and recording.

B. This is an extension of the Owner’s existing Zenitel (Vingtor-Stentofon) system.

C. The existing system head-end in Police Station has expansion capacity to accommodate the new intercoms. The Contractor is responsible for licenses.

1.3 SUMMARY

A. This Section includes the following:

1. Intercom
2. Video Intercom

1.4 REFER TO 280500.10 FOR ALL OTHER PART I REQUIREMENTS

PART 2 - PRODUCTS

2.1 VIDEO INTERCOM

A. Acceptable Manufacturers

1. Zenitel
2. Approved Equivalent

B. TCIV-3+ (Item #: 1008315030) with adapter plate or approved equivalent.

C. Minimum Features and Specifications

1. HD video up to 1080p resolution at 30 frames per second
2. IP 66 rated
3. Black Thermoplastic front plate with single button
4. Noise cancelling – suppression of musical noise
5. Noise cancelling - suppression of static noise
6. Noise cancelling - suppression of rapidly changing noise
7. Scream Alarm
8. PoE 802.3af, Class 0 (0.44W to 12.95W)
9. Operating temperature range -22 to 158 deg F (-30 to 70 deg C)

2.2 VIDEO INTERCOM MASTER

A. Acceptable Manufacturers

1. Zenitel
2. Approved Equivalent

B. ITSV-5 (Item #: 1490005010) with adapter plate or approved equivalent

C. Minimum Features and Specifications

1. Video desktop intercom supporting ICX-Alphacom, SIP, Bluetooth, and IC-Edge
2. 20.32 cm (8 in) 1200x800 capacitive 10-point touch screen HD IPS LCD
3. Dual-mic speakerphone with noise reduction, advanced acoustic echo cancellation, and excellent double-talk performance
4. Video Resolution: Up to 1080p
5. Video frame rate: Up to 30 fps
6. Power over Ethernet (PoE & PoE+)
7. Audio technology: Wide-band Opus, wide-band G.722, G.711µ/a, G.729A/B, G.726-32

D. Additional Options / Parts

1. Wall Mount Bracket (Item #: 1490009007) or approved equivalent

PART 3 - EXECUTION

3.1 GROUNDING

A. Comply with requirements in Section 270526.10 "Grounding and Bonding for Security Systems".

3.2 INTERCOMMUNICATION SYSTEMS

A. Installation

1. Install all system components including Owner furnished equipment, and appurtenances in accordance with the manufacturer's instructions, ANSI C2 and as shown including all necessary connectors, terminators, interconnections, services, and adjustments required for a complete and operable duress communications system.

B. Tamper Resistant Substations

1. Locate substations where shown on the drawings. Provide recessed back boxes in which the substation operating mechanisms shall be mounted. Mount substation with the call button centerline no higher than 42 in (1100 mm) above the finished floor.

3.3 REFER TO 280500.10 FOR ALL OTHER PART III REQUIREMENTS

END OF SECTION 281523

SECTION 282000 – VIDEO

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

B. Section 280500.10 Common Work Results for Electronic Security.

1.2 SYSTEM DESCRIPTION

A. The Video Assessment and Surveillance System (VASS) is an enterprise class system. Integrate with the PACS so the PACS provides a single unified control and management platform. Link video to events and alarms on all other systems (intrusion detection, intercommunications, and PACS) with the PACS.

B. This is an extension of the Owner's existing American Dynamics Victor system.

C. Provide a new NVR as listed in 280513.10 – Servers, Workstations, and Storage for Electronic Security with all associated licenses.

1.3 SUMMARY

A. This Section includes the following:

1. Cameras
2. Monitor
3. Transcoder

1.4 REFER TO 280500.10 FOR ALL OTHER PART I REQUIREMENTS

PART 2 - PRODUCTS

2.1 MULTI-LENS DOME CAMERA, 8MP

A. Acceptable Manufacturers

1. Hanwha Vision
2. Approved Equivalent

B. Hanwha Vision PNM-9084QZ1 or approved equivalent

C. Minimum Required Features and Specifications

1. Outdoor vandal-rated network Multi-Sensor Multi-Directional dome camera
2. Image Sensor: 4 x 2MP
3. Resolution
   a. Total: 7680 H x 1080 V
   b. Per Sensor: 1920 H x 1080 V
4. Wide Dynamic Range: 120dB
5. Frame Rates:
   a. H.265/H.264: Max. 60fps/50fps
6. 3-6mm(2x) motorized varifocal lens
7. Remote Focus
8. Day & Night Auto (ICR)
9. Max 33W (HPoE)
10. Outdoor rated IP66 and IK-10 Impact-Resistant Housing
11. Motion Detection, Tampering, Advanced Video Analytics
12. H.265, H.264, MJPEG Codec Supported
13. Minimum Illumination:
    a. Color: 0.04 Lux
    b. B/W (Night Mode): 0.004 Lux
14. Operating Temperature: -40 to 131 deg F (-40 to 55 deg C)
15. Humidity: 0% to 90% (non-condensing)
16. Total dimensions: 9.88 x 4.58” (251 x 116.5 mm)

2.2 FIXED DUAL-LENS DOME CAMERA, 4MP

A. Acceptable Manufacturers

1. Hanwha Vision
2. Approved Equivalent

B. Hanwha Vision PNM-7082RVD or approved equivalent

C. Minimum Required Features and Specifications

1. Dual-head camera housing
2. Image Sensor: 2 x 2MP
3. Effective Pixels: 1920 H x 1080 V

4. Wide Dynamic Range: extremeWDR (120dB)
5. Frame Rates: H.265/H.264: Max. 30fps
6. 3-6mm(2x) motorized varifocal lens per CH
7. Remote Focus
8. Day & Night Auto (ICR)
9. Max 20W, typical 15.5W (PoE)
10. Outdoor rated IP66, NEMA4X, and IK-10 Impact-Resistant Housing
11. Defocus detection, Motion Detection, Tampering, Virtual area (Appear/Disappear), Virtual area (Loitering/Intrusion/Enter/Exit)
12. H.265/H.264: Main/Baseline/High, MJPEG
13. Minimum Illumination:
    a. Color: 0.035 Lux
    b. B/W (Night Mode): 0.0035 Lux
14. Operating Temperature: -40 to 131 deg F (-40 to 55 deg C)
15. Humidity: Less than 95% RH (Non-condensing)
16. Total dimensions: 8.46” (W) x 5.31” (D) x 3.67” (H) (215 x 135 x 93.2 mm)

2.3 FIXED PANORAMIC CAMERA, 14MP

A. Acceptable Manufacturers

1. Axis
2. Approved Equivalent

B. Q3819-PVE or approved equivalent

C. Minimum Required Features and specifications

1. 5.9mm fixed lens
2. Image Sensor: 14 MP
3. Resolution: 8192 H x 1728 V
4. Minimum Illumination:
    a. Color: 0.16 Lux
    b. B/W: 0.06 Lux
5. Power: Power over Ethernet (PoE) IEEE 802.3at Type 2 Class 4
6. Max Draw: 22.5W, Typical 12W (PoE)
7. Frame Rate: 25/30fps
8. MicroSD,microSDHC/microSDXC
9. Outdoor rated IP66/IP67 and IK-10 Impact-Resistant Housing
10. Operating Temperature: -40 to 122 deg F (-40 to 50 deg C)
11. Total dimensions: 6.6” (H) x 7.6” (W) (170 x 195 mm)

2.4 FIXED DOME CAMERA, 2MP

A. Acceptable Manufacturers

1. Illustra
2. Approved Equivalent

B. Illustra cameras IPS02-D12-OI04 or approved equivalent

C. Minimum Required Features and specifications

1. Remote setup
2. Image Sensor: 2 MP
3. Resolution: 1920 H x 1080 V
4. Minimum Illumination:
   a. Color (Day Mode): 0.01 Lux
   b. B/W (Night Mode): 0.0001 Lux
   c. B/W (Night Mode): 0.0 Lux, IR sensitive
5. Motorized Varifocal and Focus, P-Iris
6. Power: Power over Ethernet (PoE) IEEE 802.3af/802.3at Type 1 Class 3
7. Max Draw: 12.95W (PoE)
8. Allows 90 degree image rotation for better coverage in hallways and corridors
9. True day/night CF removal
10. Max Frame Rate: 60fps
11. Micro SDXC Card Slot up to 1TB
12. Outdoor rated IP66/IP67 and IK-10 Impact-Resistant Housing
13. Operating Temperature: -58 to 149 deg F (-50 to 65 deg C)
14. Total dimensions: 5.4 x 5.3 in (138 x 135 mm)

2.5 LCD DISPLAY, 43"

A. Acceptable Manufacturers

1. Dell
2. Pelco
3. Approved Equivalent

B. Dell U4323QE or approved equivalent

C. Minimum Features and Specifications

1. 42.51-inch wide viewable image size
2. 4k 3840 x 2160 resolution with 178 degree viewing angle
3. Widescreen Aspect Ratio (16:9)
4. Contrast Ratio - 1000:1
5. Response Time - 8 ms (gray to gray)
6. Color Support: 1.07 billion colors
7. Pixel Pitch: 0.2451 mm
8. VESA compatible (100 x 100 mm, 200 x 200 mm)
9. DisplayPort connectivity

D. Additional Options / Parts

1. 100 x 100 mm, 200 x 200 mm Vesa Wall Mount

2.6 TRANSCODER

A. Acceptable Manufacturers

1. Johnson Controls

B. Johnson Controls TYCTRNSCDRA or approved equivalent

C. Minimum Required Features and specifications

1. 20 Video Transcoding Streams Supported
2. System Drive: 250 GB mSATA
3. Display Interface: 1 x DVI-D, 2 x DisplayPort v1.2
4. Unit Power: Input 480W 100-240AC; Output 12VDC @ 10A
5. Max BTU: 412
6. USB Ports: 4 x USB 2.0, 4 x USB 3.0
7. Dimensions: 11.81 x 1.73 x 8.13 in (30.0 x 4.35 x 20.64 cm)

PART 3 - EXECUTION

3.1 GROUNDING

A. Comply with requirements in Section 270526.10 "Grounding and Bonding for Security Systems" for grounding conductors and connectors.

3.2 GENERAL

A. Install all system components and appurtenances in accordance with the manufacturer's instructions, ANSI C2, and furnish all necessary interconnections, services, and adjustments required for a complete and operable system as specified. Control signals, communications, and data transmission lines grounding shall be installed as necessary to preclude ground loops, noise, and surges from affecting system operation. Equipment, materials, installation, workmanship, inspection, and testing shall be in accordance with manufacturers' recommendations and as modified herein.

B. Consult the manufacturer's installation manuals for all wiring diagrams, schematics, physical equipment sizes, etc., before beginning system installation. Refer to the Riser/Connection diagram for all schematic system installation/termination/wiring data.

C. Attach equipment to walls and ceiling/floor assemblies and be held firmly in place (e.g., sensors shall not be supported solely by suspended ceilings). Fasteners and supports shall be adequate to support the required load.

D. Current Site Conditions: Visit the site and verify site conditions are in agreement with the design package. Report all changes to the site or conditions that will affect performance of the system to the Owner. Do not take any corrective action without written permission from the Owner.

E. Cameras

1. Install cameras with the proper focal length lens as indicated for each zone
2. Set cameras with fixed iris lenses to the proper f-stop to give full video level
3. Aim camera to give field of view as needed to cover the alarm zone / intended field of view
4. Aim fixed mount cameras installed outdoors facing the rising or setting sun sufficiently below the horizon to preclude the camera looking directly at the sun
5. Focus the lens to give a sharp picture over the entire field of view.
6. Use a fine focus target for final focus adjustments.

F. Camera Pole and Mounts: The Contractor shall install the camera mount as specified by the manufacturer and as shown; provide mounting hardware sized appropriately to secure the mount, camera and housing with maximum wind and ice loading encountered at the site; provide a foundation for each camera pole as specified and shown; provide a ground rod for each camera pole of correct length as dictated by soil conductivity and connect the camera pole to the ground rod; provide electrical and signal transmission cabling to the mount location; connect signal lines and AC power to mount interfaces; connect pole wiring harness to camera.

3.3 CLEANING

A. Clean installed items using methods and materials recommended in writing by manufacturer.

B. Clean video surveillance system components, including camera-housing windows, lenses, and monitor screens.

3.4 REFER TO 280500.10 FOR ALL OTHER PART III REQUIREMENTS

END OF SECTION 282000

SECTION 283100 – INTRUSION DETECTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

B. Section 280500.10 Common Work Results for Electronic Security.

1.2 SYSTEM DESCRIPTION

A. The Intrusion Detection System is an inherent part of the PACS system. Link alarms to video system for event driven camera call-up and recording.

1.3 SUMMARY

A. This Section includes the following:

1. Motion sensors
2. Glass break sensors
3. Door position switches

1.4 REFER TO 280500.10 FOR ALL OTHER PART I REQUIREMENTS

PART 2 - PRODUCTS

2.1 CARD READER, ARM/DISARM

A. Refer to 281000 – Access Control for specifications

2.2 360 DEGREE TRI-TECH MOTION SENSOR

A. Acceptable Manufacturers

1. Bosch
2. Approved Equivalent

B. Bosch DS9370 and DS9371 or approved equivalent.

C. Minimum Features and Specifications

1. Up to 25 ft (7.6 m) mounting height
2. 360 degrees x 70 ft (20 m) diameter pattern
3. Fully-adjustable optical arrays for coverage customization
4. Rated for use in difficult environment to reduce false alarms from background disturbances such as air movement and hanging signs.
5. Combination of passive infrared (PIR) detection, microwave detection, and advanced signal processing technology.
6. Built-in tamper switch
7. Operating Temperature: -40 to 120 deg F (-40 to 49 deg C)
8. Dimensions: 3.5 x 7 in (8.9 x 17.8 cm)
9. Voltage: 9 to 15 VDC
10. UL Listed

2.3 DIRECTIONAL TRI-TECH MOTION SENSOR

A. Acceptable Manufacturers

1. Bosch
2. Approved Equivalent

B. Bosch CDL2-A15G or approved equivalent

C. Minimum Features and specifications

1. Combination of passive infrared (PIR) detection, microwave detection, and advanced signal processing technology.
2. Active infrared anti-masking
3. Microwave noise adaptive processing
4. Mounting height: 7.5 x 9 ft (2.3 x 2.75 m)
5. Coverage Pattern: 50 x 50 ft (15 x 15 m)
6. Built-in tamper switch
7. Operating Temperature: 32 to 120 deg F (0 to 49 deg C)

8. Dimensions: 4.7 x 2.75 x 2.2 in (12 x 7 x 5.5 cm)
9. Voltage: 9 to 15 VDC
10. UL Listed

2.4 GLASS BREAK DETECTOR, ACOUSTIC

A. Acceptable Manufacturers

1. Honeywell
2. Approved Equivalent

B. Honeywell FG-730 or approved equivalent

C. Minimum Features and specifications

1. Analysis of both impact and shattering frequencies
2. Signal verification
3. Coverage: 30 ft (90 m), minimum glass size: 11 x 11 in (27.9 x 27.9 cm)
4. Operating temperature: 32 to 120 deg F (0 to 49 deg C)
5. Supply Voltage: 10 to 14VDC (12 VDC nominal)
6. Mounting locations: Ceiling, opposite wall, adjoining wall, same wall as glass

2.5 DOOR POSITION SWITCH; RECESSED

A. Acceptable Manufacturers

1. Magnasphere
2. Approved Equivalent

B. Magnasphere MSS-19 Series, MSS-25 Series or approved equivalent

C. Minimum Features and Specifications

1. UL 634 Listed
2. Recessed
3. Magnetic tamper
4. 0.75 in (19 mm) or 1 in (25.4 mm) diameter
5. Capable of operating with a 0.5 in (13 mm) gap
6. Screw Terminals or 12 in (305 mm) wire leads, #22 AWG, solid

2.6 DOOR POSITION SWITCH; SURFACE

A. Acceptable Manufacturers

1. Magnasphere
2. Approved Equivalent

B. Magnasphere MSS-3X0S Series or approved equivalent

C. Minimum Features and Specifications

1. UL 634 Listed
2. Surface mounted
3. Closed Loop
4. Magnetic tamper
5. Size: 2 x 0.5 x 1 in (51 x 12.7 x 25.4 mm).
6. Capable of operating with a 0.3 in (7.6 mm) gap
7. Armored cable lead 24 in (61 mm)
8. Only for use on hatches where a standard recessed contact cannot be used

2.7 DOOR POSITION SWITCH; OVERHEAD

A. Acceptable Manufacturers

1. Magnasphere
2. Approved Equivalent

B. Magnasphere MSS-105S or approved equivalent

C. Minimum Features and Specifications

1. UL 634 listed
2. Surface Mounted with overhead door bracket
3. Capable of operating with a 0.5 inch gap
4. Magnetic tamper
5. 5 ft (1.5 m) leads

2.8 DOOR POSITION SWITCH, UL LEVEL 1, SURFACE

A. Acceptable Manufacturers

1. Magnasphere
2. Approved Equivalent

B. Magnasphere HS-L1.5 Series or approved equivalent

C. Minimum Features and Specifications

1. UL 634, Level 1 high security (both in-swing and out-swing doors)
2. Surface mounted
3. External and internal magnetic tamper
4. Size: 4.25 x 1 x 1 in (108 x 25.4 x 25.4 mm).
5. Capable of operating with a 0.25 in (6.35 mm) gap
6. Wire leads, #22 AWG, solid, in 18 in (457 mm) armored cable
7. Housing: Aluminum case, silver-gray anodized
8. Dual alarm contacts – Use for both IDS and ACS (two closed loop or one closed loop / one open loop)
9. NO adjustment required for installation

10. NO brackets needed for most out-swing door installations
11. Integrated removal / pry tamper (no back plates)

PART 3 - EXECUTION

3.1 GROUNDING

A. Comply with requirements in Section 270526.10 "Grounding and Bonding for Security Systems" for grounding conductors and connectors.

3.2 SYSTEM INTEGRATION

A. Integrate intrusion detection system with the following systems and equipment:

1. Electronic door hardware – locking/unlocking, request-to-exit
2. Elevators – none
3. Network lighting controls – none
4. Intercommunications and program systems – none
5. Public address and mass notification systems – none
6. Access control – door contacts and IDS zones
7. Fire-alarm system – none
8. Perimeter security system – none
9. Video surveillance – video call-up of appropriate camera(s) for each alarm activation

3.3 SYSTEM INSTALLATION

A. Comply with UL 681 and NFPA 731.

3.4 GENERAL

A. Supervision

1. Configure system components to continuously monitor for normal, alarm, line supervision, tamper, and trouble conditions. Indicate deviations from normal conditions at any location in system. Indication includes identification of device or circuit in which deviation has occurred and whether deviation is an alarm or malfunction.
2. Trouble Condition Signal: Indicates the system is not fully functional (e.g. sensor battery failure, open or shorted/grounded transmission line conductors, or device cover removed).

3.5 REFER TO 280500.10 FOR ALL OTHER PART III REQUIREMENTS

END OF SECTION 283100