HARVARD
UNIVERSITY

Information Technology

Harvard University Security Systems Standards

Master Format Division 280000

DIVISION 280000 ELECTRONIC SAFETY AND SECURITY
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VERSION CONTROL

VERSION #	IMPLEMENTED BY	REVISION DATE	APPROVED BY	APPROVAL DATE	REVISIONS/COMMENTS
1.0	Bala Consulting Engineers	04.01.2021	Mark Bond	04.01.2021	Initial Release
1.1	Bala Consulting Engineers	06.10.2022	Mark Bond	07.08.2022	Updated Part Numbers; Minor updates to definitions and warranty requirements.
1.2	Bala Consulting Engineers	06.12.2026	Mark Bond	06.12.2026	Updated Part Numbers; Updated VMS specifications; Updated Intercom specifications. Miscellaneous language updates.

SECTION 280000 - ELECTRONIC SAFETY AND SECURITY

PART 1 - GENERAL

1.1 SUMMARY

A. General requirements for security system work per Division 28.

1.2 RELATED SECTIONS

A. 08 71 00 – Door Hardware

B. 27 00 00 – Communications

C. 28 05 13 – Conductors and Cables for Electronic Safety and Security

D. 28 05 26 – Grounding and Bonding for Electronic Safety and Security

E. 28 05 28 – Pathways for Electronic Safety and Security

F. 28 13 00 – Access Control

G. 28 15 00 – Security Communication

H. 28 16 00 – Intrusion Detection

I. 28 23 00 – Video Surveillance

1.3 PREFERRED SECURITY SYSTEMS INTEGRATOR LIST

A. The following integrators are approved to work on security projects at Harvard University:

1. Siemens Building Technologies. 150 Royall St., Canton, MA 02021. Contact – Jonathan Freitas. Tel – TBD

2. CGL Electronic Security. 35 SW Park, Westwood, MA 02090. Contact – Mike Hull. Tel – 781-352-2697

3. Minuteman Security and Life Safety

1.4 HARVARD UNIVERISTY INFORMATION TECHNOLOGY “RULES OF THE ROAD”

A. Every project that involves work with Operation Technology (Division 25, 27 and 28) shall follow guidelines specified in Appendix A – “HUIT Rules of the Road – October 22, 2025”.

B. Installers must obtain a copy of said document from HUIT, read and understand its requirements. Any questions shall be submitted in writing to HUIT prior to commencement of any work via an approved communication channel. See Appendix A

1.5 WORK INCLUDED

A. The Work shall include installation and commissioning of the following:

1. Integrated Security Management system consisting of:
    a. Access Control and Event Monitoring System
    b. Video Management System
    c. Security Communication System
    d. Intrusion Detection System
2. Security Equipment Racks, Cabinets, and Consoles.
3. Wire and cable for all equipment as specified herein.
4. Miscellaneous conduit and back boxes (not shown on the Documents as provided but required for a complete installation).

B. Responsibilities

1. Division 8 contractor shall be responsible for:
    a. All door hardware, both powered and passive.
    b. Door hardware power supplies, both central/remote and local.
2. Division 26 contractor shall be responsible for:
    a. Back boxes, conduit and metal raceway systems as described in this document for Security cabling.
    b. Electrical line power to each secured location and hardware item
    c. Fire Alarm relay connections
3. Division 27 Contractor shall be responsible for backbone and horizontal structured cabling as specified in Division 27.
    a. Any structured cabling sub-contracted or assigned to Division 27 Contractor must be approved by HUIT and Construction Manager.
4. Security Contractor shall be responsible for:
    a. Access Control and Intrusion Detection devices for a complete and functional system.
    b. Cabling other than provided by Division 26 and 27.
    c. Monitoring and control equipment and software.
    d. Initial system programming and database population.
    e. Interface to existing EPACS System
    f. Cameras, mounts, video recorders, and accessories for a complete and functional system.

g. Cabling other than provided by Division 26 and 27.

h. Initial system programming and camera fields-of-view configuration

1.6 REFERENCES

A. All work shall be in accordance with, but not limited to, the following:

1. ANSI/NFPA 70, National Electrical Code
2. NFPA 730 – Guide for Premises Security - Latest Edition
3. NFPA 731 – Standard for the Installation of Electronic Premises Security Systems - Latest Edition
4. American National Standards Institute (ANSI)
5. National Electrical Manufacturers Association (NEMA)
6. Telecommunications Industries Association (TIA)
7. Institute of Electrical & Electronics Consultants (IEEE)
8. Underwriters Laboratories (UL)
9. UL 294 – Standard for Access Control System Units
10. UL 1076 – Standard for Proprietary Burglar Alarm Units
11. American Standards Association (ASA)
12. Federal Communications Commission (FCC)
13. Occupational Safety and Health Administration (OSHA)
14. American Society of Testing Material (ASTM)
15. Americans with Disabilities Act (ADA)
16. Local city and county Codes and ordinances
17. Appendix A – Harvard University IT Operational Technology Rules of the Road for Integrators and Installers
18. Appendix B – Harvard University policy on installation and use of video cameras.
19. Harvard University Division 27 Information Technology Standards – latest Revision.

B. In the event of conflicts, the more stringent provisions shall apply.

1.7 DEFINITIONS

A. The following definitions of terms supplement those of the General Requirements and are applicable to all sections of Division 28 - Electronic Safety and Security.

1. Provide: As used herein shall mean furnish, install, and test complete.

2. Infrastructure: As used herein shall mean cable, conduit, and raceway with all required boxes, fittings, connectors, and accessories; completely installed.

3. Work: As used herein shall be understood to mean the materials completely installed, including the labor involved to meet the design intent.

B. As used in the Documents for the Work, certain non-technical words and phrases shall be understood to have specific meanings as follows, regardless of indications to the contrary in the General Conditions or other documents governing the Work.

1. “Furnish” – Purchase and deliver to the project site complete with every necessary appurtenance and support, all as part of the Work. Purchasing shall include payment of any surcharges as may be required to assure that purchased items are free of all liens, claims, or encumbrances.

2. “Install” – Unload at the delivery point at the site and perform every operation necessary to establish secure mounting and correct operation at the proper location in the project, all as part of the Work.

3. “New” – Manufactured within the past year and never before used.

C. Regardless of their usage in codes or other industry standards, certain words or phrases as used in the Documents for the Work, shall be understood to have the specific meanings as ascribed to them in the following list:

1. “As indicated” – As shown on, and/or in accordance with, the Documents.

2. “Circuit” – Any specific run of circuitry.

3. “Circuitry” – Any Work which consists of wires, cables, raceways, and/or specialty wiring method assemblies complete with associated junction boxes, pull boxes, outlet boxes, joints, couplings, splices, and connections except where limited to a lesser meaning by specific description.

4. “Concealed” (as applied to circuitry) – Covered completely by building materials, except for penetrations (by boxes and fittings) to a level flush with the surface as necessitated by functional or specified accessibility requirements.

5. “Documents” – The term “Documents” means all security and security related drawings, specifications, and associated sketches, details, riser diagrams, Owner guidelines etc.

6. “Exposed” (as applied to circuitry) – Not covered in any way by building materials.

7. “Patch Panel” – A system of terminal blocks, patch cords, and backboards that facilitate administration of cross-connecting cables.

8. “Raceway” – Any pipe, duct, extended enclosure, or conduit (as specified for a particular system) which is used to contain wires and which is of such nature as to require that the wires be installed by a pulling in procedure. Where the

word “conduit” is used without specific reference to type, it shall be understood to mean “raceway”.

9. “Relocate existing” – Remove existing item from present location. Reinstall, re- connect, and test existing item and make ready for use at new location as indicated.

10. “Remove existing “– Remove existing item and return item to Owner.

11. “Replace” – Remove existing item and return item to Owner. Provide new item as indicated.

12. “Riser” – Shall refer to the portion of the installation that transmits between building floors or between security system rooms; also referred to as “Back-bone Cabling”.

13. “Security Closet” – The enclosed area or room specifically designated for the routing, termination, and/or cross connecting of security system cable to other security system cable and/or equipment.

14. “Security system Wiring” – see “Circuitry”.

15. “Wiring” – See “Circuitry”.

1.8 ABBREVIATIONS AND ACRONYMS

A. The following abbreviations and acronyms shall apply to this document and its companion sections for clarification and direction.

1.	ACP	Access Control Panel
2.	ACS	Access Control System
3.	AFF	Above Finished Floor
4.	AHJ	Authority Having Jurisdiction
5.	AI	Artificial Intelligence
6.	ARC	Aluminum Rigid Conduit
7.	AWG	American Wire Gauge
8.	BAS	Building Automation Systems
9.	BTU	British thermal Unit
10.	CCTV	Closed-Circuit Television
11.	°F	degrees Fahrenheit
12.	ft	feet
13.	EMT	Electrical Metallic Tubing

14.	EPACS	Electronic Physical Access Control System
15.	FT	Fiber Transceiver
16.	GbE	Gigabit Ethernet
17.	GRC	Galvanized Rigid Conduit
18.	HUIT	Harvard University Information Technology
19.	HUPD	Harvard University Police Department
20.	HU	Harvard University
21.	Hz	Frequency in Hertz (k = kilo, M = Mega, G = Giga)
22.	ID	Inside Diameter
23.	in	inch
24.	lbs	pounds
25.	IDS	Intrusion Detection System
26.	IDF	Intermediate Distribution Frame
27.	ICP	Intrusion Control Panel
28.	IMC	Intermediate Metallic Conduit
29.	IP	Internet Protocol
30.	LAN	Local Area Network
31.	MAC	Media Access Control (Address)
32.	Mbps	Megabits per second
33.	MDF	Main Distribution Frame
34.	ML	Machine Learning
35.	NVR	Network Video Recorder
36.	OSDP	Open Supervised Device Protocol
37.	OD	Outside Diameter
38.	PACS	Physical Access Control System
39.	PM	Project Manager
40.	PoE	Power-over-Ethernet protocol
41.	PVC	Polyvinyl Chloride

42.	RNC	Rigid non-metallic conduit
43.	RU	Rack Unit
44.	SAN	Storage Area Network
45.	SCS	Security Communication System
46.	SMS	Security Management System
47.	SOC	Security Operations Center
48.	TGB	Telecommunications grounding busbar
49.	TMGB	Telecommunications main grounding busbar
50.	TR	Telecommunications Room
51.	UPS	Uninterruptible Power Supply
52.	VMS	Video Management System
53.	WAN	Wide Area Network
54.	WLAN	Wireless Local Area Network
55.	VoIP	Voice over Internet Protocol

1.9 CONFIDENTIALITY REQUIREMENT

A. The Work is critical to the security of the Owner's facility. All Documents and other material and information about the Work are confidential information and must remain secure and confidential at all times. Confidential information must not be deliberately or inadvertently disclosed to anyone other than the Contractor's personnel and sub-contractors who require disclosure to perform their portion of the Work.

B. The Contractor shall keep track of all confidential information at all times and shall ensure that all copies are accounted for at all times. The Contractor shall not permit any persons to have access to the confidential information of the Work unless and until the Contractor has assured itself of the trustworthiness of such persons.

1.10 PROJECT DRAWINGS

A. Drawings are generally diagrammatic and show design intent, the arrangement and location of pathways, outlets, support structures, and equipment. Carefully investigate the structural and finish conditions affecting security work and arrange this work accordingly. Should conditions on the job make it necessary to make adjustments to pathways or materials, advise and secure approval before proceeding with such work.

B. It shall be understood that the Specifications and Drawings are complementary. Where there are conflicts between the Documents or within the Specifications or Drawings themselves, the overall security design intent shall govern. In addition – an item or service of higher overall cost shall be assumed accepted where conflict exists. Owner representative shall provide a final direction on conflict resolution.

C. Where exact locations are required by equipment for stubbing-up and terminating conduit concealed in floor slabs, request Drawings, equipment location Drawings, foundation Drawings, and any other data required to locate the concealed conduit before the floor slab is poured.

D. Materials, equipment, or labor not indicated but which can be reasonably inferred to be necessary for a complete installation shall be provided. Drawings and Specifications do not undertake to indicate every item of material, equipment, or labor required to produce a complete and properly operating installation.

E. The right is reserved to make reasonable changes in locations of equipment indicated on Drawings prior to rough-in without increase in contract cost.

F. The size or number of conduit runs indicated shall not be reduced without written approval.

G. Any work installed contrary to contract Drawings shall be subject to change as directed, and no extra compensation will be allowed for making these changes.

H. The location of equipment, support structures, outlets, and similar devices shown on the Drawings are approximate only. Do not scale Drawings. Obtain layout dimensions for equipment from architectural plans unless indicated on the Drawings.

I. Schematic diagrams shown on the Drawings indicate the required functions only. The technology of a particular manufacturer may be used to accomplish the functions indicated without exact adherence to the schematic Drawings shown. Additional labor and materials required for such deviations shall be furnished at no additional expense.

J. Verify the ceiling type, ceiling suspension systems, and clearance above hung ceilings prior to ordering cabling and associated hardware. Provide notification of any discrepancies.

K. Portions of these Drawings and Specifications are abbreviated and may include incomplete sentences. Omissions of words or phrases such as “shall,” “shall be,” “as indicated on the Drawings”, “In accordance with”, “a”, “the”, and “all are intended” shall be supplied by inference.

1.11 QUALITY ASSURANCE

A. Contractor Qualifications

1. Work specified herein shall be the responsibility of the Security Contractor. Security Contractor must be one of the Harvard University approved contractors, no exceptions without prior Harvard University approval.

2. The Contractor shall have local in-house engineering and project management capabilities consistent with the requirements of the Work.

3. By submitting a bid, the Contractor thereby certifies that it is qualified in all areas pertaining to, directly or indirectly, the Work. In the event the Contractor becomes unable to complete the Work in accordance with the Documents, or the satisfaction of the Owner, it shall be the responsibility of the Contractor to

retain the services of applicable manufacturers' representatives to expeditiously complete the Work in accordance with the Owner's construction schedule with no additional cost to the project and Owner.

4. The Contractor shall maintain, or establish and maintain, a fully staffed office including a service center capable of providing maintenance and service to the Project. The Contractor shall staff the service center with factory trained technicians and adequately equip the office to provide emergency service within four (4) hours after being called, 24 hours per day.

5. The Contractor shall provide factory-certified technicians to install, commission, and maintain the Work. All installing personnel shall be licensed as required by local and/or state jurisdictions.

6. The Contractor shall ensure compliance with, and have a thorough understanding of, all local codes and contract conditions pertaining to this Project.

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

B. Product Standards

1. All equipment and materials contained herein shall be the products of recognized manufacturers and shall be new.

2. New equipment and materials shall:

   a. Be Underwriters Laboratories, Inc. (UL.) listed and approved where specifically called for; or where normally subject to such UL labeling and/or listing services.

   b. Be clearly labeled identifying make, model, and manufacturer.

   c. Be without blemish or defect.

   d. Comply with Standards specified by the Harvard Office of Sustainability.

3. It is the intent of these specifications that wherever a manufacturer of a product is specified, and the terms "other approved" or "approved equal" are used, the substituted item must conform in all respects to the specified item. Consideration will not be given to claims that the substituted item meets the performance requirements with lesser construction. Performance as delineated in schedules and in the specifications shall be interpreted as minimum performance.

4. Substituted equipment or optional equipment, where permitted and approved, must conform to space requirements. Any substituted equipment that cannot meet space requirements, whether approved or not, shall be replaced at the Contractor's expense. Any modifications of related systems because of substitutions shall be made at the Contractor's expense.

5. The approval of shop drawings, or other information submitted in accordance with the requirements hereinbefore specified, does not ensure that the Security Consultant, Architect, or the Owner attests to the dimensional accuracy, dimensional suitability of the material, or mechanical performance of equipment. Approval of shop drawings does not invalidate the Documents.

6. Substitutions of equipment shown on the schedules or designated by model number in the specifications will not be considered if the item is not a regular catalogued item carried by the manufacturer.

7. Manufacturers Recommendations: Where installation procedures of any part thereof are required to be in accordance with the recommendations of the manufacturer of the material being installed, printed copies of these recommendations shall be furnished prior to installation. Installation of the item will not be allowed to proceed until the recommendations are received. Failure to furnish these recommendations may be cause for rejection of the material.

8. The Contractor shall provide a complete fit-out of the security equipment within TRs for review by the Consultant and Owner prior to continuing with the installation of the other TRs. The security portion of TR fit-out shall include all cabinets, conduit, troughs, blocks, power supplies, frames, labels, penetrations, etc. See HU Division 27 Information Technology Standards for spaces allotted for security equipment within a typical E-MDF and E-IDF.

9. Within the Specifications, certain manufacturers have been listed. These manufacturers are listed for example purposes (unless followed by “No Exceptions”). The Contractor may substitute manufacturers and models that may be more cost effective or readily available than that specified. However, all substitutions shall meet or exceed the specified functional and technical requirements. Acceptance of such substitutions is at the discretion of the Consultant and/or Owner.

10. All exterior devices shall be sealed and protected against all weather conditions consistent with the region including heat, cold, moisture, and dust in accordance with manufacturer recommendations and industry standards. Exterior enclosures shall conform to the appropriate NEMA standard for the condition.

11. All exterior devices shall be fastened with tamper resistant security screws.

1.12 SEQUENCING

A. This implementation plan describes the general approach that shall be followed to minimize the down time of the security systems.

B. Plan and schedule all work in such a sequence as to minimize the time before the system is operational. The following is a suggested work sequence:

1. Order all equipment needed and notify any subcontractors to schedule their participation.

2. Perform all system layout work.

3. Insure there are an adequate number of power receptacles available to operate all security equipment and coordinate as to where power is available.

4. Provide shop Drawings to verify location of all equipment, conduit runs, power connections, etc. Submit shop Drawings to the Engineer for review and approval.

5. Coordinate to provide space in each TR for mounting of equipment as designated by Harvard standards.

6. Provide training on how to fill out the programming sheets for access levels.

7. Prepare and pre-test all equipment to the greatest extent possible.

8. Install all equipment. Prior to turning systems ON – provide all relevant network information to Owner as required in Appendix A.

9. Provide training on the programming other various options.

10. Test and inspect all systems.

11. Perform all other Work as required.

12. Perform the Acceptance Test.

13. Provide training.

14. Provide as-built Drawings. As-built drawings shall be inclusive of all addendums, bulletins and change order scope incorporated into the project.

1.13 SCHEDULING

A. Within five (5) days after being awarded the contract, prepare and submit for information, an estimated progress schedule for the Work. The progress schedule shall be related to the entire project and shall indicate start and completion dates. Should project dates be questionable or in flux, contractor shall plan to begin with Day 0 and progress accordingly.

1.14 WARRANTY AND MAINTENANCE

A. Security Contractor shall provide a one-year warranty for the Work. Contractor shall provide an option, for Owner’s review, for 3-year warranty plan and 5-year warranty plan. The warranty shall cover all Work, systems, and subsystems against defects in materials and workmanship. The Work as specified herein, including all materials and labor, but excepting any existing devices and equipment which are incorporated in the completed Work, shall be warranted to be free from defects in design, workmanship, and materials. Further, the Contractor shall warrant that the completed systems, including all components (except those, which are existing or provided by others), are of sufficient size and capacity to fulfill the requirements of the Specifications.

B. The warranty shall be valid for a period of one year following the date of system acceptance by the Owner. System acceptance shall commence when all parts,

components, sub- systems, and systems have been tested, shown to be working in accordance with the Specification, and approved by the Owner

C. Nothing contained in the Documents shall be construed to establish a shorter period of limitation with respect to any other obligation, which the Contractor might have under the Documents or any manufacturer's warranty. The establishment of the time period of one year after the date of final acceptance of the Work or such longer period of time as may be prescribed by law or by the terms of any warranty required by the Documents, relates only to the specific obligation of the Contractor to correct the Work, and has no relationship to the time within which its obligation to comply with the Documents may be sought to be enforced, nor to the time within which proceedings may be commenced to establish the Contractor's liability with respect to its obligations other than specifically to correct the Work or equipment.

D. Warranty Service:

1. If defects in the materials and/or workmanship are identified during the warranty period, the Contractor shall provide all labor and materials as may be required for immediate correction of the defect.

2. During the warranty period, the Contractor shall, upon receipt of a request for service from the Owner, deploy service personnel to the Owner's premises within four hours to initiate corrective action.

3. All warranty service and repair work shall be performed by personnel, who have been trained, certified and is experienced in the operation and maintenance of the installed system(s).

4. Unless otherwise requested by the Owner, warranty service shall be performed during normal business hours, exclusive of Holidays. If the Owner requests warranty service to be performed during other than normal business hours, the Contractor shall be compensated for such service at 150% of their normal hourly service rates as listed in the bid proposal for this project.

5. Warranty service shall include the repair or replacement of all parts and/or components as required to restore normal system operation. In the event that system parts or components must be removed for repair, it shall be the responsibility of the Contractor to furnish and install temporary parts and/or components as required to restore normal system operation until the repaired parts or components can be repaired and re-installed.

6. It shall be the responsibility of the Contractor to maintain an inventory of spare parts or to arrange for manufacturer parts support as required ensuring correction of all critical component failures or malfunctions within 48 hours of the Owner's request for service. Critical parts shall be defined as those, which govern or affect the normal operation of more than one field device.

7. The Contractor's warranty obligation shall include correction of any software/firmware defects, which may be identified during the warranty period.

8. If the Contractor determines and successfully demonstrates to the Owner that service or repairs are required as a result of misuse, abuse, or abnormal wear

and tear, the Contractor shall be compensated for such service or repairs at the Contractor's hourly rates as listed in the bid proposal for the Project. Similarly, such compensation to the Contractor shall apply if repairs are required for devices and equipment not provided by the Contractor but incorporated in the completed systems. Should manufacturer identify the fault related to a defect in install, contractor shall be responsible for repair at no cost to owner.

9. Immediately following the completion of a warranty repair or service call, the Contractor's service personnel shall submit a written report to the Owner which details the service work performed, the cause of the trouble, and any outstanding work which is required to restore complete and normal operation.

10. Refer to Terms and Conditions of Master Service Agreement for additional requirements related to warranty services. If discrepancies are noted, the Terms and Conditions of MSA shall prevail.

E. The Owner reserves the right to expand or add to the system during the warranty period using firm(s) other than the Contractor for such expansion without affecting the Contractor’s responsibilities, provided that the expansion is done by a firm which is an authorized dealer or agent for the equipment or system being expanded.

F. The Contractor shall perform preventative maintenance during the warranty period as part of the warranty service. The Contractor shall submit a list of items to be included in the preventative maintenance program and the service to be performed.

G. Include a manufacturer’s software maintenance agreement as part of the Warranty. This agreement shall include all software updates, revisions, telephone service assistance, and training for any changes in operation.

H. Provide written notice to the Owner documenting any Work performed during the warranty period, including any preventative maintenance Work performed.

I. Provide loaner equipment that is fully compatible with the SMS for any equipment that is not field-repairable.

J. Loaner equipment for components that must be shipped to/from the manufacturer or distributor shall be on site and operational within 48 hours of the component failure. Furnish lists of equipment that will require shipment from the manufacturer or distributor and lead times associated with that equipment. Loaner equipment must be the same as the equipment it is replacing and be already approved by HU.

K. Repair or Replacement Service

1. Repair or replacement service during the warranty period shall be performed in accordance with the following schedule:

a. Schedule A: 7 days, 24 hours per day with a four (4) hour response time

b. Schedule B: Normal business hours, excluding holidays, with a four (4) hour response time.

2. Schedule A shall apply for major system components including, but not limited to, the file and storage servers, system workstations, control panels, intercom and communication stations, CCTV cameras and any other components that would create security vulnerabilities if non- functional.

3. Schedule B shall apply for all other components and devices.

4. As part of the proposal submission, the Contractor shall include a labor rate schedule for any warranty service required during hours not covered under Schedule B.

L. Failure to Perform Service

1. Schedule A Components: The Contractor shall provide thirty (30) days of additional total system warranty (at no additional cost to the Owner) for every two (2) consecutive days of system or device failure.

2. Schedule B Components: The Contractor shall provide fifteen (15) days of additional total system warranty (at no additional cost to the Owner) for every two (2) consecutive days of system or device failure.

M. If the Contractor is unable to restore system operation during the warranty period within two (2) business days of a system failure, the Owner reserves the right to require the Contractor to provide on-site manufacturer's service technicians at no cost to the Owner.

N. Provide on-line software maintenance and support during the warranty period for all security system software and hardware.

1.15 SUBMITTALS

A. Submit for approval, details of all materials, equipment, and systems to be furnished. Work shall not proceed without approval of the submitted items.

B. General Description and Requirements

1. Submit pre-fabrication submittals in accordance with the construction schedule.

2. Pre-fabrication submittals shall consist of product data, Shop Drawings, samples, and a detailed completion schedule. Partial submittals will not be accepted without prior written approval.

3. Pre-fabrication submittals shall be furnished in electronic formats as defined by the General Conditions under Part 1 of the Project Specifications.

4. No portion of the Work shall commence, nor shall any equipment be procured until approval of the pre-fabrication submittals has been given in writing.

5. A letter of transmittal identifying the name of the Project, Contractor’s name, and date submitted for review shall accompany pre-fabrication submittals along with a list of items transmitted.

C. IP-based Device Submittal requirements

1. Prior to installation of IP network-based devices, and not later than sixty (60) days prior to device installation, the contractor shall submit to HUIT the following IP device parameters for network resource allocation:

   a. Manufacturer and model number of each device, as well as physical location.

   b. Firmware version

   c. PoE requirements for each device

   d. MAC address of each device

   e. Network TCP/IP and UDP ports

   f. Network diagram that graphically represents network topology including device addresses.

   g. If a new product/technology system is being proposed for installation that is not currently used at HU – the contractor shall provide a test system to use for validation.

D. Product data required as part of the pre-fabrication submittal shall include the following:

1. Equipment schedules listing all system components, manufacturer, model number and the quantity of each.

2. General functional descriptions for each system

3. Manufacturer's data specification sheets for all system components, including any warranty information (sheets containing more than one device or component model number shall be clearly marked to delineate items included in the Work)

4. A complete list of cable and wiring types, sizes, manufacturer, and model number.

5. A complete list of finishes and sample graphics, including custom artwork and custom graphics (if applicable)

6. List of parts inventories to provide manufacturer recommended service and maintenance of the Work.

E. Shop Drawings shall include the following:

1. Floor plan drawings indicating device locations with device legends and identifying device numbers.

2. System riser diagram with all devices, wire runs, and wire designations.

3. Schematic block diagrams for each system showing all equipment, interconnects, data flow, etc.

4. Wiring diagrams for each subsystem defining the interconnection of all inputs and outputs for all equipment.

5. Wiring diagram for fail-safe release of electric locking mechanical locks, in accordance with the local authority having jurisdiction's standards.

6. Fabrication Shop Drawings for all custom equipment (if applicable)

7. Plans and elevations of the security console(s) and equipment racks quantifying all equipment to be mounted therein.

8. Elevations of TR layouts showing panel locations, power supply locations, conduit, wire ways, troughs, wire molds, and all other equipment.

9. Submit samples of any equipment components upon request.

10. Samples submitted shall be the latest version of equipment.

11. It is the responsibility of the Contractor to confirm all dimensions, quantities, and the coordination of materials and products supplied by the Contractor with other trades. Approval of Shop Drawings containing errors does not relieve the Contractor from making corrections at their expense.

12. Submittals for individual systems and equipment assemblies that consist of more than one item or component shall be made for the system or assembly. Partial submittals will not be considered, reviewed, or stored and such submittals will not be approved.

13. Shop Drawings shall include equipment racks, termination blocks, connection details, rack mounting details, and any other details not included in the Construction Drawings.

14. Power Supply Schedule of all power supplies installed as a part of this project. This schedule shall list power supplies by sequential alphanumeric designator, manufacture and model number, input, and output voltages.

15. Camera Schedule of all cameras installed as a part of this project. This schedule shall consist of a table that designates if the camera is interior (I), exterior (E), what floor the camera is located on, a sequential unique number, purpose of the camera, and its intended view.

16. Matrix shall consist of all cameras included as a part of this project. This matrix shall consist of a table that list all cameras and designates the recording settings and alarm triggers. Include the following:

    a. Camera recording configuration: always record, record on motion, etc.

    b. Pre-record start time when recording on motion.

    c. Coordination action

1) Display video on monitor

2) Activate alarm

3) Pan/tilt event location

F. Any materials and equipment listed that are not in accordance with Specification's requirements may be rejected.

G. The approval of material, equipment, systems, and Shop Drawings is a general approval subject to the Drawings, Specifications, and verification of all measurements at the job. Approval does not relieve the responsibility of shop drawing errors. Carefully check and correct all Shop Drawings prior to submission for approval.

H. Sustainable Design Documentation, General:

1. Submit a completed Section 018113.1 - PRODUCT DATA SUBMITTAL FORM - LEED v4 for each product required.

2. LEED Requirements:

a. LEED EQc2, Low-Emitting Materials, General Emissions Evaluation: Building products must be tested and determined compliant in accordance with California Department of Public Health (CDPH) Standard Method v1.1–2010, using the applicable exposure scenario.

1) For adhesives and sealants, submit test results, including TVOC emissions and VOC content.

2) For paints and coatings, submit test results, including TVOC emissions and VOC content.

3) For wet-applied products, submit volume used.

3. Coordinate with project manager for sustainability requirements.

4. Alternate LBC, Sustainable Design Intent: Comply with project requirements intended to achieve sustainable design, according to the Living Building Challenge (LBC). Refer to Section 018114 - SUSTAINABLE DESIGN REQUIREMENTS – LBC

PART 2 - PRODUCTS (SECTION NOT USED)

PART 3 - PART 3 - EXECUTION

3.1 LANGUAGE USAGE

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

3.2 EXAMINATION OF CONDITIONS

A. Prior to the start of work, carefully inspect the installed work of other trades and verify that such work is complete to the point where installation may properly commence. Start of work indicates acceptance of conditions.

B. Install equipment in accordance with applicable codes and regulations, the original design intent, and the referenced standards.

C. In the event of a discrepancy, immediately notify the Construction Project Manager, HUPD and HUIT.

D. Do not proceed with installation until unsatisfactory conditions and discrepancies have been fully resolved.

3.3 PROTECTION OF SYSTEMS AND EQUIPMENT

A. Upon receipt of Owner furnished equipment, verify quantities, dimensions, manufacturer and model numbers to be suitable for project use prior to installation.

B. Protect materials and equipment from damage during storage at the site and throughout the construction period. Equipment and materials shall be protected during shipment and storage against physical damage, dirt, theft, moisture, extreme temperature, and rain.

C. Damage from rain, dirt, sun, and ground water shall be prevented by storing the equipment on elevated supports and covering the sides with securely fastened protective rigid or flexible waterproof coverings.

D. During installation, equipment shall be protected against entry of foreign matter on the inside and be cleaned both inside and outside before testing, operating, or painting.

E. As determined by the Project Manager, HUPD or HUIT, damaged equipment shall be fully repaired or shall be removed and replaced with new equipment to fully comply with requirements of the contract documents. The decision of HUIT and HUPD shall be final.

F. Damaged paint on equipment and materials shall be repainted with painting equipment and finished with the same quality of paint and workmanship as used by the manufacturer.

3.4 ACCESS TO EQUIPMENT

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

B. Working spaces shall be not less than specified in the National Electrical Code (NEC) for voltages specified.

C. Where the Project Manager determines that the installed equipment is not conveniently accessible for operation and maintenance, equipment shall be removed and reinstalled, one time only, as directed by the Construction Project Manager, at no

additional cost. “Conveniently accessible” is defined as being capable of being reached without the use of ladders or without climbing or crawling under or over obstacles such as motors, pumps, transformers, piping, and duct work, except where required by design or intent.

3.5 INSTALLATION

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

B. If any security systems equipment to be installed in MDF or IDF rooms, all equipment locations must be coordinated with project manager prior to install.

C. Perform all Work as indicated in the Drawings and Specifications.

D. The Contractor shall install the appropriate cable from the head-end equipment, system workstation, to readers, door contacts, request-to-exit devices, cameras, communication devices and electric locks at each opening, camera, intercom, or other security field device.

E. All communications cables shall be kept away from power circuits.

F. The Contractor shall install the power supply(s) for electric locks in locations where they will not interfere with other operations.

G. The Contractor shall also execute adequate testing of the system to insure proper operation.

H. The Contractor shall provide adequate training of the system users to ensure adequate understanding to prevent operating errors.

3.6 SYSTEM HEALTH MONITORING

A. The Contractor shall provide and configure an automated health monitoring for all networked security devices: cameras, controllers, intercoms and servers.

B. The system shall generate alerts to Owner within 15 minutes of device going offline.

C. A minimum system uptime standard of 99.5% shall be defined for PACS controllers and VMS recording infrastructure, measured monthly.

3.7 WORKMANSHIP

A. Comply with highest industry standards, except when specified requirements indicate more rigid standards or more precise workmanship.

B. Perform Work with persons experienced and qualified to produce workmanship specified.

C. Maintain quality control over suppliers and Subcontractors.

D. Quality of workmanship is considered important. Project Manager shall have the authority to reject Work which does not conform to the Drawings and Specifications.

3.8 EQUIPMENT PRE-TEST

A. All major equipment (cameras, controllers, intercom devices, power supplies, etc.) shall be bench tested as per manufacturer's instructions prior to delivery to job site and prior to installation.

3.9 PENETRATIONS

A. Do not penetrate any roof, flashing, exterior wall, or parapet without prior approval from designated Construction Project representative.

B. When penetrating a fire wall for passage of cables and/or conduit, always provide a fire- stop system that complies with code and the local authority having jurisdiction.

3.10 FIRE RATED DOORS AND FRAMES

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

3.11 POWER TO SECURITY EQUIPMENT

A. Power all equipment from circuits dedicated for security use, except as noted. Mark all panel circuit breakers with labels worded "Security Equipment - Do Not Operate", or equivalent.

B. Plug-in transformers shall not be used for any security head-end equipment.

C. AC power dedicated to security and on generator backup shall be provided for the Security System as indicated on the Documents. Coordinate with the Architect and Electrical Engineer to establish locations of dedicated AC circuits.

D. Connect to the AC power and provide UL listed power supplies and transformers to distribute low voltage power to the System components as required.

E. Provide hinged cover terminal cabinets with tamper switches for all power supplies, transformers, and power distribution terminal strips. Tamper switches shall be connected to ACS and monitored.

F. Surge Protection

1. Provide protection against spikes, surges, noise, and other line problems for all Security System equipment and components.

2. Protect all exterior video, control, power, signal cables, and conductors against power surges. Ethernet surge protectors shall not attenuate or reduce data rate of signals under normal conditions. Each surge protector shall be UL Listed.

G. All power and data to be terminated within the provided enclosure.

3.12 CUTTING AND PATCHING

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

3.13 PAINTING

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

3.14 PLYWOOD BACKING

A. Install the control panels, power supplies, and all other related equipment on a plywood backboard. The plywood shall be A/C grade type, covered with two coats of fire-retardant paint. Do not cover plywood stamp fire-rating stamp with paint.

3.15 CLEANING

A. During construction, and prior to acceptance of the building, remove from the premises and dispose of packing material and debris caused by electronic security work.

B. Remove dust and debris from interiors and exteriors of security equipment.

3.16 MANUFACTURER PROFESSIONAL SERVICES

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

B. Professional Services personnel shall be employed by the manufacturer of the security management system and shall be thoroughly knowledgeable of the security management system applications.

C. Professional Services personnel shall be on-site and available to meet for a period of not less than two consecutive days.

3.17 SYSTEM START-UP

A. The Work shall be complete and ready to operate prior to final acceptance.

B. Load the entire initial user database into all programmable systems up to the day of initial use of the system. HUPD and owner/operator shall provide procedural guidelines and defining terminology and conditions unique to the HUPD's operation.

C. For phased work, initial testing shall be conducted, however that testing shall not reflect final acceptance.

3.18 SYSTEM ACCEPTANCE

A. Final acceptance testing of the Work will be conducted by the Architect, Consultant, HUPD, HUIT, facility manager, project manager and owner/operator.

B. Prior to any final acceptance testing, the Contractor shall submit two (2) sets of preliminary Record Drawings to the Architect. The preliminary Record Drawings are to be used by the Architect to conduct the system final test.

C. The Contractor shall submit a report matrix indicating completion or delinquency for each item included in the Specification and all subsequent addenda and bulletins as part of the Work. Should work on any item be under way, but not yet fully complete,

indicate the extent (or lack thereof) of completion to date, and the proposed date of completion.

D. Conduct a complete test of the entire system and provide the Project Manager, HUPD, HUIT, and owner/operator with a written report on the results of all tests. During this test, place the integrated system in service and calibrate and test all equipment.

E. Fully complete a Security Systems Readiness Checklist prior to the test of the system. The checklist shall accompany the written certification to HUPD,HUIT, and owner/operator that the installed complete system has been calibrated, tested, and is fully functional as specified herein.

F. Following completion of the initial testing and correction of any noted deficiencies, conduct a five (5) day burn-in test. The intent of the burn-in test shall be to prove the system by placing it in near real operating conditions. During this period, the system shall be fully functional and programmed such that all points, interfaces, controls, reports, messages, prompts, video, etc. can be exercised and validated. Record and correct any system anomaly, deficiency, or failure noted during this period. Scheduling of the final acceptance test shall be based on a review of the results of this burn-in test.

G. Deliver a report describing the results of functional tests, burn-in tests, diagnostics, calibrations, corrections, and repairs including written certification to HUPD, HUIT, and owner/operator that the installed complete system has been calibrated, tested, and are fully functional as specified herein.

H. Prior to the final acceptance test, coordinate with project manager for HUIT to review for security related construction clean-up requirements. TRs, security equipment closets, and similar areas should be free of accumulation of waste materials or rubbish caused by operations under the Contract. At completion of the Work, remove all waste materials, rubbish, the Contractor’s and its subcontractors’ tools, construction equipment, machinery, and all surplus materials.

I. Upon written notification from the Contractor that the system is completely installed, integrated, and operational, and the burn-in testing completed, HUPD, HUIT, facility manager, Project Manager, and owner/operator will conduct a final acceptance test of the entire system.

J. During the final acceptance test by HUPD, HUIT, and owner/operator, the Contractor shall be responsible for demonstrating that, without exception, the completed and integrated system complies with the contract requirements. All physical and functional requirements of the project shall be demonstrated and shown. This demonstration will begin by comparing “as built” conditions of the system to requirements outlined in the Specification, item by item. Following the Specification compliance review, all system head-end equipment will be evaluated.

K. To sufficiently demonstrate the system’s functionality, the Security Operations Center operator on duty and his/her superior may be requested to perform certain daily operations inherent to the system.

1. As all these operations depend heavily on the training outlined within the Specification, the Contractor shall have completed all the required training prior to initiation of the final acceptance test.

L. The functionality of all interfaces between systems will be tested.

M. Following the system head-end equipment and console review, the installation of all field devices will be inspected. Areas examined will include general neatness and quality of installations, complete functionality of each individual device, and mounting, back box and conduit requirements compliance.

N. All equipment shall be fully operational during testing procedures. The Contractor shall provide all personnel, equipment, and supplies necessary to perform all site testing. A minimum of two (2) employees familiar with the system for the final acceptance test shall be present during the testing. One employee shall be responsible for monitoring and verifying alarms while the other will be required to demonstrate the function of each device. Supply at least two (2) two-way radios for use during the test. A manufacturer's representative may be present on site to answer any questions that may be beyond the technical capability of the Contractor's employees, if the Contractor so elects or by specific request of the Engineer or Owner, at no charge to the Engineer or Owner. All testing must be performed in conjunction with HUPD, HUIT, and owner/operator.

O. Upon successful completion of the final acceptance test (or subsequent punch list retest) the Engineer will issue a letter of final acceptance.

P. Harvard University retains the right to suspend and/or terminate testing at any time when the system fails to perform as specified. If it becomes necessary to suspend the test, all of the Owner's/Engineer's fees and expenses related to the suspended test will be deducted from the Contractor's retainage. Furthermore, in the event it becomes necessary to suspend the test, the Contractor shall work diligently to complete/repair all outstanding items to the condition specified in Documents. The Contractor shall supply Harvard University with a detailed completion schedule outlining phase-by-phase completion dates and a tentative date for a subsequent punch list retest. During the final acceptance test, no adjustments, repairs, or modifications to the system will be conducted without the permission of HUPD, HUIT, and owner/operator.

3.19 RECORD DOCUMENTATION

A. Record Documentation shall include all information required in the Pre-fabrication Submittals but revised to reflect "as installed" conditions.

B. General Description and Requirements

1. Submit Record Documentation in accordance with the Architect's construction schedule.

2. Record Documentation shall consist of Record Drawings and Operation and Maintenance Manuals.

3. Provide a letter of transmittal with Record Documentation identifying the name of the Project, Contractor's name, date submitted for review, and a list of items transmitted.

4. Prior to the final acceptance of the Work, submit two draft sets of the Record Drawings portion of Record Documentation to HUPD, HUIT, Construction Project Manager, and owner/operator. The draft copy shall be used during the final acceptance testing by the Engineer.

5. Update all record documentation to reflect changes or modifications made during final acceptance testing as required and submit three blue/black lines and one reproducible set.

C. Record Drawings

1. Produce all Record Drawings using the latest version of AutoCAD. Record Drawings shall, at a minimum, include the following:

   a. Floor plan drawings indicating device locations, with device legends indicating manufacturers and model numbers for each device.

   b. Floor plan drawings indicating wire routing. Wire routing shall be delineated in straight line runs and be tagged with cable identification and terminal strip numbers to coincide with the installation.

   c. Mounting details for all equipment and hardware

   d. Functional block diagrams for each subsystem

   e. Wiring details showing rack elevations, equipment wiring and terminations, and inter-rack wiring

   f. Wiring diagrams for all custom circuitry including interfaces to various control output-controlled devices.

   g. Typical point-to-point wiring diagrams for each piece of equipment and groups of equipment within the system

   h. Layout details for each riser location, including security panels, power supplies, junction boxes, conduit, and any other security related equipment.

D. Operation and Maintenance Manuals

1. Operation and Maintenance Manuals shall apply to all security related devices, equipment, and software modules.

2. Operation and Maintenance Manuals shall be formatted as follows:

   a. Identify each manual's contents on the cover.

b. Provide a table of contents and tabulated sheets for each manual. Place tab sheets at the beginning of each chapter or section and at the beginning of each appendix if applicable.

c. Any hardware manual demonstrating more than one model number of devices on any one page shall be clearly marked as to delineate which model has been implemented in the Work.

3. Operation and Maintenance Manuals shall include, at a minimum, the following:

a. Operational description of each subsystem

b. Detailed programming descriptions for each subsystem

c. Explanations of subsystem interrelationships

d. Electrical schematics for each piece of equipment specified

e. Power-up and power-down procedures for each subsystem

f. Description of all diagnostic procedures

g. A menu tree for each subsystem

h. Setup procedures for each component of the subsystems

i. A list of manufacturers, their local representatives, and subcontractors that have performed Work on the Project

j. Installation and service manuals for each piece of equipment

k. Maintenance schedules for all installed components

4. Operation and Maintenance Manuals shall include a separate section for each software program incorporated into the Project. The software section shall include, at a minimum, the following information:

a. Definitions of all software related terms and functions

b. Description of required sequences

c. Description of all communications protocols, including data formats, command characters, and a sample of each type of data transfer

d. Instructions for manufacturer supplied report generation

e. Instructions for custom report generation

f. Database format and data entry requirements

E. Login Credentials, Licenses and System Configuration files

1. The contractor shall provide all admin and installer usernames and passwords to HU. There must not be any system or software that is protected by password that only the installer can make changes.

2. Register all licenses to Harvard University name, including license keys and any information needed to reinstall or move the software.

3. Provide HU with all account access to manufacturer's support sites and portals (if available), with the ability to open and escalate support tickets directly by HU personnel.

4. Provide all configuration settings and programming files at project closeout, that are required to restore the system during hardware or software failure or vendor change.

F. Procedure for Resubmitting

1. Make corrections or changes as required by the Engineer, HUPD or HUIT for security designs and resubmit when the Engineer's stamp requires re-submittal.

2. Clearly identify changes made other than those specifically requested by the Engineer when resubmitting Record Drawings. Changes shall be clouded or similarly highlighted as coordinated with the Engineer. Only changes that have been specifically requested by the Engineer or have been clouded by the Contractor will be reviewed on resubmittals.

3. Any drawing sheets added to the resubmittal shall be clearly identified and clouded and shall not change the sheet numbering scheme for previously issued Record Drawings.

4. The Contractor shall be responsible for any delays caused by the re-submittal process.

5. Re-submittal Review Fees

a. If the Engineer, HUPD, HUIT, and owner/operator rejects the Contractor's Record Submittal (Rejected, Revise, and Resubmit) more than two times, the Engineer or Harvard University will be compensated for all subsequent reviews, whether partial or comprehensive. The amount of such compensation will be incorporated by Change Order and withheld from the Contractor's Application for Payment.

3.20 TRAINING

A. Coordinate specific training program requirements with system owner/operator prior to commencement of training.

B. Contractor shall provide complete operator training on the security system. Training shall consist of eight (8) hours of classroom instruction for three (3) people, plus two (2) hours of individual hands-on training on the installed system for each of three (3) people. Hands-on training shall include the opportunity for each person to operate the installed system, and to practice each operation that an operator would be expected to perform.

C. Training shall cover all operating features of the system.

D. Contractor shall provide written training materials for each of three (3) people.

E. Training sessions shall include the opportunity for each person to operate the system, and to practice each operation that an operator would be expected to perform.

END OF SECTION 280000

SECTION 280513 – CONDUCTORS AND CABLES FOR ELECTRONIC SAFETY AND SECURITY

PART 1 - GENERAL

1.1 GENERAL REQUIREMENTS

A. Applicable requirements of Division 01 - General Requirements and Division 28, Section 280000 shall be considered a part of this section and shall have the same force as if printed herein full.

B. The work to be done under this section of the Specifications shall include the furnishing of labor, material, equipment, and tools required for the complete installation of the work indicated on the Drawings, as specified herein, or as noted in other sections of Division 28 – Electronic Safety and Security.

C. All products not provided by Harvard University shall be new and unused and shall be of manufacturers' current and standard production.

1.2 RELATED SECTIONS

A. 280000 - ELECTRONIC SAFETY AND SECURITY

B. 270000 – HARVARD UNIVERSITY INFORMATION TECHNOLOGY STANDARDS

1.3 WORK INCLUDED

A. The scope of work for this project shall include cables and conductors for the security system.

PART 2 - PRODUCTS

2.1 GENERAL

A. General: Provide all wire and cable required to install systems as indicated. Wire and cable shall be sized to provide minimum voltage drop and minimum resistance to the devices being supplied.

B. All cables shall be specifically designed for their intended use (direct burial, aerial, etc.).

C. Comply with equipment manufacturers recommendations for wire and cable size and type.

D. Comply with all applicable codes and ordinances.

2.2 WIRE AND CABLE

A. General Requirements:

1. All wire and cable shall be Underwriter's Laboratories (UL) listed, and shall meet all national, state, and local code requirements for its application.

2. All wire and cable shall meet individual system or subsystem manufacturer Specifications.

3. All wire and cable shall be Plenum type cable and shall conform to the minimum requirements of Insulated Cable Engineers Association (ICEA) Standards.

4. Wire and cable shall comply with the applicable requirements of the National Electrical Code (NEC), latest edition, regarding cable construction and usage.

5. The conductors of wires shall be copper and have conductivity in accordance with the standardization rules of the Institute of Electrical and Electronics Engineers, Inc. (IEEE). The conductor and each strand shall be round and free of kinks and defects.

6. All cables carrying data or voice transmissions shall be shielded. All other cable shall be shielded where necessary for interference-free signals.

7. Insulation shall be rated for a minimum of 300V.

8. Color-coding shall be accomplished by using solidly colored insulation. Grounding conductors, where insulated, shall be colored solid green or identified with green color as required by the National Electric Code (NEC).

B. Wire Types and Sizes

1. Signal Cable (Non-Power): Wire size shall be a minimum of 22 AWG, twisted, shielded, stranded, insulated, and jacketed.

2. Signal Cable (Low Voltage Power): Wire size shall be a minimum of 18 AWG, stranded, insulated, and jacketed.

   a. Wire size shall be a minimum of 18 AWG, twisted, stranded, insulated and jacketed and shall be used for cable runs less than 500 feet.

   b. Wire size shall be a minimum of 16 AWG, twisted, stranded, insulated and jacketed and shall be used for cable runs in excess of 500 feet, but less than 750 feet.

   c. Wire size shall be a minimum of 14 AWG, twisted, stranded, insulated and jacketed and shall be used for cable runs in excess of 750 feet, but less than 1,250 feet.

C. Composite Cable for Access Controlled Doors for non-OSDP readers (requires approval from HUIT)

1. Composite cable shall contain the following cable types: 22 AWG 3-pair (Qty 1), 22 AWG 2 Conductor (Qty 1), 22 AWG 4 Conductor (Qty 1), 18 AWG 4 Conductor (Qty 1)

2. Acceptable Manufacture: See Appendix D

D. Composite Cable for Access Controlled Doors for OSDP readers

1. Composite cable shall contain the following cable types: 22 AWG 1-pair Shielded Lo-Cap (Qty 1) and 18 AWG 2 Conductor (Qty1), 22 AWG 2 Conductor (Qty 1), 22 AWG 4 Conductor (Qty 1), 18 AWG 4 Conductor (Qty 1)

2. Acceptable Manufacture: See Appendix D

E. Card Reader, non-OSDP

1. Cable shall be a 22 AWG, 6 Conductor

2. Acceptable Manufacture: See Appendix D

3. Use of non-OSDP wiring and protocol requires written and documented approval by HUIT.

F. Card Reader, OSDP

1. Cable shall be a 22 AWG, 2-twisted pair, Shielded, Low-Capacitance.

2. Acceptable Manufacture: See Appendix D

G. Electric Lock Cable

1. Cable shall be an 18AWG, 2 Conductor

2. Acceptable Manufacture: See Appendix D

H. Door Contact Cable

1. Cable Shall be an 22AWG, 2 Conductor

2. Acceptable Manufacture: See Appendix D

I. Request to Exit or Accessory Cable

1. Cable Shall be and 18AWG 4 Conductor

2. Acceptable Manufacture: See Appendix D

J. Cabling for security devices connected to Ethernet network

1. Shall be provided by the Telecommunications Contractor under Division 270000.

2. Shall consist of (4) twisted pairs, 23 AWG or greater.

3. Shall be Category 6 Augmented cabling (CAT 6A)

4. Refer to Harvard University Division 270000 Communications Specifications.

K. IP Network Patch Cables for Security Equipment

1. Owner shall provide patch cables for network connectivity within Telecommunication Rooms and where necessary to complete the Security System Work.

2. Refer to HUIT Division 270000 Communications Specifications.

L. Elevator Traveler Cable

1. All elevator traveler cabling required for security devices shall be provided and installed by the Elevator Contractor.

2. All elevator cab penetrations required for security devices shall be provided by the Elevator Contractor.

3. The Security Contractor shall coordinate the requirements of traveler cabling and security devices with the Elevator Contractor, and HUIT.

4. At a minimum, each elevator cab shall be provided with cable infrastructure for (1) Card Reader and (1) IP Camera, even if these devices are not indicated on the plans. This will accommodate future security devices if necessary.

5. Card Reader Cable

a. (1) One 2-twisted pair OSDP-compliant 22 AWG (min) stranded shielded cable and drain wire from the elevator car operating panel to the elevator machine room car controller.

b. Provide 3' service loop at the car operating panel and sufficient length in the elevator machine room to reach the Security System Interface Panel, plus 4' service loop. Cable shall be un-spliced.

6. Fixed IP Camera Cable

a. IP Camera: (1) RG-6/U CCTV coaxial cable and (1) 2- conductor 18 AWG (min) stranded cable with an overall braided shield and drain wire from the elevator car ceiling to the elevator machine room car controller.

b. Provide 6' service loop at the car ceiling and sufficient length in the elevator machine room to reach the Security System Interface Panel, plus 4' service loop. Cable shall be un-spliced.

c. Refer to specification section 282300 for PoE over Coax Video Encoder specifications.

PART 3 - EXECUTION

3.1 GENERAL

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

3.2 SITE INSPECTIONS

A. Continuously verify that the site conditions are in agreement with the Documents and the design package. Submit a report to the Architect documenting changes to the site

or conditions that affect the performance of the System to be installed. For those changes or conditions, which affect System installation or performance, provide (with the report) specification sheets, or written functional requirements to support the findings, and a cost estimate to correct the deficiency. No deficiency shall be corrected without written permission from the Architect.

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

3.3 COORDINATION

A. Coordinate with the Architect and project manager to ensure that adequate conduit is provided, and that equipment back-boxes are adequate for System installation.

B. Coordinate with the Architect to ensure that adequate power has been provided and properly located for the security System equipment.

C. Coordinate with the Architect to ensure that doors and door-frames are properly prepared for electric locking hardware and door position switches.

D. Coordinate locations of all devices with the Architect prior to installation.

3.4 INSTALLATION

A. Design, layout, size, and plan new wire and cable runs as required.

B. All wire and cable from the processors to all devices at each door shall be “home-run” without splices unless otherwise specified.

C. All wire and cable, including any wire and cable that is existing and will be reused in the Work, shall be installed in conduit, surface metal raceway, or pathway as described in construction documents, except as follows:

1. Wire or cable, in lengths of less than ten (10) feet, that is “fished” within walls, ceilings, and doorframes.

D. All wire and cable passing thru metalwork shall be sleeved by an approved grommet or bushing.

E. Avoid splicing conductors. All splices shall be made in junction boxes (except at equipment). Splices shall be made with an approved crimp connection. Wire nuts shall not be used on any low-voltage wiring. Where necessary, provide heat-shrink to insulate all wire splices and connections. The use of electrical tape for splices and connections shall not be acceptable.

F. Identify all wire and cable at terminations at every junction box. Identification shall be made with an approved permanent label.

G. Furnish and install all SMS wire and cable except for traveling cable for elevator control and monitoring and unshielded twisted pair cable for LAN.

H. Coordinate the protection and routing of wire and cable requiring isolation from power, radio frequency, electromagnetic interference, telephone, etc. with the Architect.

I. Wire and cable within ICs, power distribution cabinets and other security enclosures shall be neatly installed, completely terminated, pulled tight with slack removed and routed in such a way as to allow direct, unimpeded access to the equipment within the enclosure. All wire and cable shall be bundled and tied.

J. Visually inspect all wire and cable for faulty insulation prior to installation.

K. Provide grommets and strain relief material where necessary to avoid abrasion of wire and excess tension on Wire and Cable.

L. Make connections with solder-less devices, mechanically and electrically secured in accordance with the manufacturers' recommendations. Wire nuts shall not be an acceptable means of connecting wire and cable.

M. Neatly bundle and wrap all horizontally run (above accessible ceilings and not within conduit) wire and cable at 5-foot intervals. Provide supports as required. All supports shall be UL listed for the application.

N. All System wiring within vertical riser shafts (as required) shall be bundled, wrapped and tied to the structure at 10-foot intervals in order to isolate it from other wire and cable within the shaft. Additionally, all wire and cable within the shaft shall be supported every on floor. Provide all personnel and equipment necessary to install and support the cable. All equipment shall be UL listed for the application.

END OF SECTION 280513

SECTION 280526 - GROUNDING & BONDING FOR ELECTRONIC SAFETY AND SECURITY

PART 1 - GENERAL

1.1 GENERAL REQUIREMENTS

A. Applicable requirements of Division 01 - General Requirements and Division 28, Section 280000 shall be considered a part of this section and shall have the same force as if printed herein full.

B. The work to be done under this section of the Specifications shall include the furnishing of labor, material, equipment, and tools required for the complete installation of the work indicated on the Drawings, as specified herein, or as noted in other sections of Division 28 – Electronic Safety and Security.

C. All products not provided by Harvard University shall be new and unused and shall be of manufacturers' current and standard production.

D. Systems, design, equipment, components, cabling, materials, installation, labeling, and testing shall comply with these reference documents, including the following:

1. TIA 607-D, "Bonding and Grounding for Telecommunications Cabling and Equipment in Commercial Buildings", (Latest Edition)

2. National Electric Code, ANSI/NFPA 70 (Latest Edition)

3. BICSI "Telecommunications Distribution Methods Manual" (Latest Edition)

4. BICSI "Electronic Safety and Security Design Reference Manual" (Latest Edition)

5. All other applicable electrical and building codes

1.2 RELATED SECTIONS

A. 280000 - ELECTRONIC SAFETY AND SECURITY

1.3 WORK INCLUDED

A. The scope of work for this project shall include grounding and bonding conductors and devices for Electronic Safety and Security System.

PART 2 - PRODUCTS

2.1 SYSTEM COMPONENTS

A. Comply with TIA-607-D.

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.

C. Grounding Conductor Sizing Chart:

LENGTH (IN FEET)	CONDUCTOR SIZE (AWG)
0 - 13	6
14 - 20	4
21 - 26	3
27 - 33	2
34 - 41	1
42 - 52	1/0
53 - 66	2/0
67 - 84	3/0
85 - 105	4/0
106 - 125	250 KCMIL
126 - 150	300 KCMIL
151 - 175	350 KCMIL
176 - 250	500 KCMIL
251 - 300	600 KCMIL
GREATER THAN 300	750 KCMIL

D. Bare Copper Conductors:

1. Solid Conductors: ASTM B 3.

2. Stranded Conductors: ASTM B 8.

3. Tinned Conductors: ASTM B 33.

4. Bonding Conductor: Minimum No. 6 AWG, stranded conductor. Refer to chart above and TIA-607-D for the correct conductor size, based upon distance.

5. Bonding Jumper: Tinned-copper tape, braided conductors terminated with two-hole copper ferrules; 1-5/8 inches wide and 1/16 inch thick.

2.3 CONNECTORS

A. Approved Manufacturers:

1. Panduit

2. Harger

3. Thomas and Betts

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

C. Compression Wire Connectors: Crimp-and-compress connectors that bond to the conductor when the connector is compressed around the conductor.

1. Comply with UL 467.

2. Electroplated tinned copper, C and H shaped.

D. Busbar Connectors: Cast silicon bronze, solderless compression-type, mechanical connector; with a long barrel and two holes spaced on 5/8- or 1-inch centers for a two-bolt connection to the busbar. The correct connector shall be supplied, based upon the size of the connector being terminated. Single hole connection to busbar shall not be accepted.

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

2.4 GROUNDING BUSBARS

A. Provided by telecommunications contractor. See Harvard University Division 270000 Master Specifications for sizes.

2.5 LABELING

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

B. Adhesive Film Label with Clear Protective Overlay: Machine printed, in black, by thermal transfer or equivalent process. Minimum letter height shall be 3/8 inch. Overlay shall provide a weatherproof and UV-resistant seal for label.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine the building 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 connection to nearest acceptable electrical service ground busbar and to the telecommunications service entrance ground busbar.

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

D. Proceed with connection of the grounding system 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-D.

D. Conductors: Install stranded conductors for 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 6 AWG, based upon the length of the conductor

2. The bonding conductors between the TMGB and structural steel of steel-frame buildings shall not be smaller than 1/0 AWG, based upon the length of the conductor.

E. 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 Structural Steel: Welded connectors.

F. Conductor Support:

1. Secure grounding and bonding conductors at intervals of not less than 36 inches.

G. 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. Maximum distance between supports shall not exceed 36”.

4. Install grounding and bonding conductors exposed (without the use of conduit) unless otherwise specified. The pathway for grounding and bonding conductor pathway through a plenum shall also be exposed (without the use of conduit), unless otherwise indicated.

5. 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 280528 "Pathways for Electronics Safety and Security", and bond both ends of the conduit to a TGB.

3.3 CONNECTIONS

A. Bond metallic equipment in a telecommunications equipment room to the grounding busbar in that room, using equipment grounding conductors not smaller than 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 tools specific to the connector.

2. Apply an antioxidant compound to all bolted and compression connections.

D. Security Enclosures and Equipment Racks: Bond metallic components of enclosures to the telecommunications bonding and grounding system.

3.4 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

B. Perform the following 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 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.

3. With the grounding infrastructure completed and the communications system electronics operating, measure the current in every conductor connected to the TMGB and in each TGB. Maximum acceptable AC current level is 1 Ampere.

C. Excessive Ground Resistance: If resistance to ground at the bonding conductor 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 and submit test and inspection reports.

END OF SECTION 280526

SECTION 280528 - PATHWAYS FOR ELECTRONIC SAFETY AND SECURITY

PART 1 - GENERAL

1.1 GENERAL REQUIREMENTS

A. Applicable requirements of Division 01 - General Requirements and Division 28, Section 280000 shall be considered a part of this section and shall have the same force as if printed herein full.

B. The work to be done under this section of the Specifications shall include the furnishing of labor, material, equipment, and tools required for the complete installation of the work indicated on the Drawings, as specified herein, or as noted in other sections of Division 28 – Electronic Safety and Security.

C. All products not provided by Harvard University shall be new and unused and shall be of manufacturers' current and standard production.

D. Systems, design, equipment, components, cabling, materials, installation, labeling, and testing shall comply with these specifications and associated referenced documents, including the following:

1. TIA-569-E, "Telecommunications Pathways & Spaces" (Latest Edition)
2. TIA-606-C, "Administration Standard for Telecommunications Infrastructure", (Latest Edition)
3. National Electric Code, ANSI/NFPA 70 (Latest Edition)
4. BICSI "Telecommunications Distribution Methods Manual", (Latest Edition)
5. BICSI "Electronic Safety and Security Design Reference Manual", (Latest Edition)
6. All other applicable electrical and building codes

1.2 RELATED SECTIONS

A. 280000 - ELECTRONIC SAFETY AND SECURITY

1.3 WORK INCLUDED

A. The scope of work for this project shall include back boxes, enclosures, pathways and conduits for Electronic Safety and Security System.

PART 2 - PRODUCTS

2.1 METAL CONDUITS AND FITTINGS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. AFC Cable Systems, Inc.

2. Allied Tube & Conduit.
3. Alpha Wire Company.
4. Anamet Electrical, Inc.
5. Electri-Flex Company.
6. O-Z/Gedney.
7. Picoma Industries.
8. Republic Conduit.
9. Robroy Industries.
10. Thomas & Betts Corporation.
11. Western Tube and Conation.
12. Wheatland Tube Company.

B. General Requirements for Metal Conduits and Fittings:

1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
2. Comply with ANSI/TIA-569-E.

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

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

1. Conduit Fittings for Hazardous (Classified) Locations: Comply with UL 886 and NFPA 70.
2. Fittings for EMT:
   a. Material: Steel or die cast
   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, with overlapping sleeves protecting threaded joints.

H. 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 PATHWAYS AND FITTINGS FOR FIBER OPTIC CABLE

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Alpha Wire Company.
2. Arnco Corporation.
3. Endot Industries.
4. Ipex.
5. Thomas and Betts/Carlon.

B. Description: Comply with UL 2024; flexible-type pathway, approved for plenum installation unless otherwise indicated.

1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
2. Comply with ANSI/TIA-569-E.

2.3 BOXES, ENCLOSURES, AND CABINETS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Hoffman Enclosures.
2. Nema Enclosures.
3. Integra Enclosures.
4. Cooper B-Line.
5. Thomas and Betts/Carlon.

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

1. Comply with ANSI/TIA-569-E.
2. Boxes, enclosures, and cabinets shall be listed for use in the applied environment.

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

D. Box extensions used to accommodate new building finishes shall be of same material as recessed box.

E. Metal Floor Boxes:

1. Material: sheet metal.

2. Type: Fully adjustable, fire-rated where installed in an existing structural floor slab. Fire rating of enclosure should be consistent with the fire rating of the structural floor slab.

3. Shape: Rectangular for raised floor and circular for poke thru.

4. Listing and Labeling: 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. Small Sheet Metal Pull and Junction Boxes: NEMA OS 1.

G. Device Box Dimensions: 4 inches square by 2-1/8 inches deep.

H. Gangable boxes are permitted.

I. Non-metallic 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 with continuous-hinge cover with flush latch unless otherwise indicated.

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

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

3. NEMA 250, Type 3R for damp and wet locations.

K. Cabinets:

1. NEMA 250, Type 1 galvanized-steel box with removable interior panel and removable front, finished inside and out with manufacturer's standard enamel. Type 3R boxes will be required for damp or wet locations.

2. Hinged door in front cover with flush latch and concealed hinge.

3. Key latch to match panel boards.

4. Metal barriers to separate wiring of different systems and voltage.

PART 3 - EXECUTION

3.1 PATHWAY APPLICATION

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

1. Exposed, Not Subject to Physical Damage: EMT or RNC.

2. Exposed, Not Subject to Severe Physical Damage: EMT.

3. Exposed and Subject to Severe Physical Damage: GRC or IMC.

4. Concealed in Ceilings and Interior Walls and Partitions: EMT.

5. Damp or Wet Locations: GRC or IMC.

6. Pathways for Optical Fiber or Communications Cable in Spaces Used for Environmental Air: Plenum-type, communications-cable pathway as applicable for entire length throughout in EMT.

7. Boxes and Enclosures: NEMA 250 Type 1, except use NEMA 250 Type 3 in institutional and commercial kitchens and damp or wet locations.

B. Minimum Pathway Size: 3/4-inch trade size.

1. Pathway size shall be in accordance with the manufacturer's specifications, instructions, and recommendations to maintain minimum bend radius unless otherwise indicated.

2. Pathway quantities and sizes shall be sufficient to accommodate the quantities, sizes, and types of cables indicated on the drawings.

3. Fill calculations shall be performed to determine the quantities and sizes of pathways based upon the indicated cables for the initial installation.

C. 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. EMT: Use compression steel fittings. Comply with NEMA FB 2.10.

D. Do not install nonmetallic conduit where ambient temperature exceeds 120 degrees F.

3.2 INSTALLATION

A. Comply with NECA 1, NECA 101, and TIA-569-E for installation requirements except where requirements on Drawings or in this article are stricter. Comply with NECA 102 for aluminum pathways. Comply with NFPA 70 limitations for types of pathways allowed in specific occupancies and number of floors.

B. Keep pathways at least 12 inches away from parallel runs of flues and steam or hot-water pipes. Install horizontal pathway runs above water and steam piping.

C. Complete pathway installation before starting conductor installation.

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

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

F. Support conduit within 12 inches of enclosures to which attached.

G. Stub-ups to Above Recessed Ceilings:

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.

H. 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.

I. Install pathways square to the enclosure and terminate at enclosures with locknuts. Install locknuts hand tight plus 1/4 turn more.

J. 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.

K. Cut conduit perpendicular to the length. For conduits of 2-inch trade size and larger, use roll cutter or a guide to ensure cut is straight and perpendicular to the length.

L. Install pull wires in empty pathways. Use polypropylene or monofilament plastic line with not less than 200-lb tensile strength. Leave at least 12 inches slack at each end of pull wire. Cap underground pathways designated as spare above grade alongside pathways in use.

M. Surface Pathway are not permitted.

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

1. 1.5-Inch Trade Size and Larger: Install pathways in maximum lengths of 75 feet.

2. 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.

O. Expansion-Joint Fittings:

1. Install fitting(s) that provide expansion and contraction for at least 0.000078 inch per foot of length of straight run per deg F of temperature change for metal conduits.

2. Install expansion fittings at all locations where conduits cross building or structure expansion joints.

3. 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.

P. Mount boxes at heights indicated on Drawings. If mounting heights of boxes are not individually indicated, give priority to ADA requirements.

Q. All outside plant pathways shall be provided with pulling hand hole every 300 feet.

R. Do not install raceway and boxes within existing concrete or masonry walls.

S. Horizontally separate boxes mounted on opposite sides of a wall, so they are not in the same vertical channel.

T. 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.

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

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

W. Install sleeves and sleeve seals at penetrations of exterior floor and wall assemblies.

X. Install firestopping at penetrations of fire-rated floor and wall assemblies.

3.3 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 280528

SECTION 281300 - ACCESS CONTROL

PART 1 - GENERAL

1.1 GENERAL REQUIREMENTS

A. Applicable requirements of Division 01 - General Requirements and Division 28, Section 280000 shall be considered a part of this section and shall have the same force as if printed herein full.

B. The work to be done under this section of the Specifications shall include the furnishing of labor, material, equipment, and tools required for the complete installation of the work indicated on the Drawings, as specified herein, or as noted in other sections of Division 28 – Electronic Safety and Security.

C. All products not provided by Harvard University shall be new and unused and shall be of manufacturers' current and standard production.

1.2 RELATED SECTIONS

A. Provide the work of this Section in accordance with requirements of the Contract Documents.

B. Comply with requirements of section 280000 - Electronic Safety and Security.

1.3 WORK INCLUDED

A. The Work shall include furnishing all labor, materials, tools and equipment, and documentation required for a complete and working system as specified in this Section. System shall consist of but not limited to - Controllers, Credential Readers (Card Readers), Sensors, Switches, Relays, Wireless Locks, Electrified Door Hardware, Software, Programming, Power Supplies, and Licensing.

B. The scope of work to be included in this contract does not necessarily include every item of work. The Contractor shall supply and install items that meet the specified requirements of the construction documents. The SMS Servers and Workstations shall be furnished by Owner. All software licenses for all devices shall be provided by the contractor.

C. Dedicated, secure equipment space shall be provided to accommodate access control panels and power supplies for electric locking hardware and system controllers. This shall be located in E-MDF or E-IDF as indicated in Div 270000 specifications Appendix A. Equipment (including batteries and other serviceable devices) shall not be located above ceilings. SMS controllers shall be installed within the access-controlled space in a locked and monitored enclosure with local battery backup and full functionality at controlled space if communications are lost. Any new SMS network shall be compatible for direct interconnection with current and planned networks installed in the campus. Security systems shall operate over the University's dedicated security VLAN, and all workstations supporting said security systems shall be dedicated to the security function only as well.

D. All doors with access control shall have a position switch to allow notification to Security of forcing door open without authorized entry, propping of the door, or opening of

selected doors during times when they should not be accessed. All designated security doors, with or without card readers shall have position switch(es) to allow indication of status, with alarming software applications that provides for alarming by time of day and for door being held opened in excess of a user selectable time period or opening of selected doors during times when they should not be accessed.

E. Harvard University currently operates C-Cure 9000 Access Control System manufactured by Johnson Controls (Software House). All new panels and devices being installed shall seamlessly connect to and be integrated inside C-Cure 9000.

1. HUIT and HUPD shall verify the version of the software in use at the present time and verify all components being installed are compatible with the existing system.

2. The Security contractor will be responsible for coordinating and providing requirements for any licensing needed for C-Cure 9000 Satellite Application Server upgrades. All work to upgrade Satellite Application Server licensing shall be performed by Harvard University.

3. The Contractor shall verify in conjunction with Harvard University staff that the existing server for the access control software meets or exceeds the manufacturers' specifications.

F. Harvard University Housing currently operates PremiSys Resident Manager system manufactured by IDenticard. All new wireless residence locks and perimeter wired IP openings at HU Housing projects shall be seamlessly connected and integrated inside PremiSys or CCure system, as directed by Harvard.

1. HU Housing staff is to verify the version of the software in use at the present time and verify all components being installed are compatible with the existing system.

2. The Security contractor will be responsible for coordinating and providing requirements for any licensing needed for PremiSys upgrades. All work to upgrade PremiSys licensing shall be performed by HU Housing staff.

3. The Contractor shall coordinate wireless network access for HU Housing projects with HU and Comcast (Comcast provides and maintains Wireless 802.11 network at HU Housing projects).

G. The work to be provided, in addition to designing, furnishing, and installing the SMS, shall include the following:

1. Provide complete system design and engineering.

2. Provide ancillary software that meets specified contract requirements.

3. Verification that proposed equipment and devices furnished are adequate for the intended purpose.

4. Programming of SMS server and any related ancillary equipment with assistance of HUPD or owner/operator staff.

5. Perform a layout check to ensure that adequate access is available for construction, installation, and maintenance of equipment and devices furnished; however, the Contractor is not responsible for furniture or millwork.

6. Should any integration be required - provide connections and programming for system integration with the VMS, Intrusion and Security Communication systems.

7. SMS system administration shall be by Harvard University. The System Administrator shall be responsible to configure and maintain the system after system acceptance. System utilities shall be provided for the System Administrator to use. All passwords for any installer accounts should be provided by the contractor to Harvard University.

8. All copies of licenses and software shall be provided to HUIT and HUPD.

H. The Contractor shall be responsible for all initial programming, software configuration, and graphics development to provide a complete operating SMS System as described here in. Harvard University will be responsible for the creation of the personnel database and assigning access levels and privileges to individual cardholders and shall provide a form to the Project Manager containing the requirements/information needed to complete this task.

PART 2 - ACCESS CONTROL SYSTEM

2.1 ACCESS CONTROL SOFTWARE

A. HU owns and operates C-Cure 9000 access control software as manufactured by Software House. All new control panels shall be integrated into the existing access control platform.

2.2 INTELLIGENT CONTROLLER

A. Network ready controller that supports up to 32 readers. Controllers shall be available in rackmount or wall-mount configuration. Controllers shall be provided with lock power management and run Linux based kernel for its operating system

B. Acceptable Manufacturers: See Appendix D.

2.3 INPUT/OUPUT MODULES

A. Expansion modules shall provide input and output expansions to Access Control System. The panels shall be connected to main door controller via RS-485 RM bus

B. Acceptable Manufacturers: See Appendix D.

2.4 POWER SUPPLY

A. The Controller Power Supply shall be dedicated to the Controller and shall not provide power for locks or any other low voltage device.

B. The Power Supply shall provide the following:

1. 120 or 230 VAC 60 Hz input voltage and provide filtered and conditioned output voltage as required.

2. 400W power available for door locks, capable in dual voltage selection per output (12/24VDC).

3. Eight (8) hours of battery backup to provide continuous operation during power failure.

4. 12V 7Amh batteries (quantity – up to four, or to carry normal operation load of hours indicated above).

5. A battery charger to maintain the battery.

6. Low battery and power fail contacts to monitor the status of the input power and the battery within SMS.

7. Be all-in-one enclosure capable of house controller panels, power supplies, power distribution modules, batteries, and communication devices.

C. Each Power Supply shall be housed in a locking steel enclosure designed for surface mounting. The housing shall include a tamper switch to sense the removal or opening of the enclosure cover. All power supplies, Controllers, and power distribution cabinets shall be keyed alike.

D. Acceptable Manufacturers: See Appendix D.

2.5 ACCESS CONTROL CARD READER

A. The card reader shall operate at 13.56 MHz and shall read encoded data from access cards and transmit the data to the Door Controller.

B. The card readers shall connect to Controllers utilizing Wiegand interface. Card readers shall be OSDP Version 2 ready.

C. A two-color LED and an audible tone shall indicate authorized and unauthorized reader uses. Operation of LEDs, and audible tones shall be consistent throughout the system (Steady Red – locked; Slow Flash red/green – unlocked; Fast Flash red/green – in alarm). LED colors shall be coordinated with Owner/Operator.

D. The card reader and bit pattern shall not be proprietary to the Contractor.

E. Acceptable Manufacturer and Model Number: See Appendix D

1. Card readers shall be manufactured by HID Global and distributed via HID Elite Key program.

2.6 ACCESS CONTROL CREDENTIALS

A. The credentials currently in use at HU are part of HID iClass SE Elite program. All credentials are furnished by Harvard Campus Service Center and are not part of the project. Any credentials required for project use during install and testing shall be coordinated with Project Manager and Harvard ID-Office.

2.7 ELECTRIFIED LOCKING DEVICES

A. The door hardware supplier shall provide all electric locks, latch retraction devices, electric strikes, delayed egress locking devices and high in-rush current power supplies required by hardware manufacturer for warranty purposes. Coordination required with Division 087100 specifications section prior to rough-in and installation of any door hardware devices.

B. Delayed Egress Door hardware requirements

1. Interface to delayed egress power supplies/controllers as necessary to facilitate required operation to include:

a. Delayed egress locking devices shall unlock automatically for the following conditions:

1) Any building fire alarm

2) Loss of building power

3) Failure of the power supply

b. Provide monitoring of the normally closed alarm contact that shall open upon activation of the unlock timer.

c. Provide lock control of delayed egress locking device through output contacts activated by the controller or application server.

d. Contractor shall furnish the necessary cable required for integration of delayed egress hardware. Contractor shall coordinate with Architect/owner to confirm desired input and output functionality for delayed egress hardware.

C. Offline Wireless Locks (HU Housing only projects)

1. Coordinated connectivity requirements and integration of all locks provided for residential housing projects. Locks shall be provided by Div. 08 contractor.

2. All wireless lock battery service and maintenance shall be carried out by HU Housing.

3. Acceptable Manufacturer: See Appendix D.

2.8 REQUEST-TO-EXIT DEVICE, MOTION SENSOR

A. Provide request-to-exit (REX) infrared motion sensors for detecting authorized exits through card reader-controlled doors as indicated on the Documents. Permission to use request-to-exit devices at Harvard University shall be coordinated with Owner. Door hardware integrated switches are preferred method for request-to-exit.

B. For doors equipped with electromagnetic locks, activation of the REX motion sensor shall release the electric locking mechanism.

C. For doors equipped with electric locks devices that are free exiting at all times (i.e. mortise electric locks, electric strikes, etc.), the REX motion sensor shall only shunt the door switch monitor and shall not unlock the lock.

D. Minimum Specifications:

1. Detection tech: PIR

2. Adjustable Detection pattern:

a. 4 ft x 2 ft (1.2 m x .75 m) to 10 ft x 5 ft (3 m x 1.5 m) depending on mounting height

3. Output contact: Two (2) Form C relay contacts

4. Electrical: 12 VAC/VDC to 30 VAC/VDC

5. Mounting: Door frame lintel or ceiling

E. Acceptable Manufacturers: See Appendix D.

2.9 REQUEST-TO-EXIT DEVICE, PUSHBUTTON

A. Provide REX pushbuttons for unlocking card reader-controlled doors with electromagnetic locks as indicated on the Documents.

B. Activation of the REX pushbutton shall release the lock and shall shunt the intrusion alarm output. The REX pushbutton shall contain an adjustable pneumatic timer for door unlock and shall be intrinsically fail-safe to release the door(s) in the event of a failure of the exit control circuitry within the door controller. All REX pushbuttons shall be labeled to meet local codes.

C. Minimum Specifications:

1. Pushbutton diameter: 1.25 in. (38 mm) minimum, or as required by code

2. Pushbutton color: Standard Finish

3. Pushbutton Engraving: PUSH TO EXIT

4. Engraving Color: Red, or as required by code

D. Acceptable Manufacturers: See Appendix D.

2.10 REMOTE DOOR RELEASE PUSHBUTTON

A. Provide Door Release Pushbuttons as indicated in the Documents.

B. The Pushbutton shall operate as follows:

1. Each use of a Pushbutton shall be recorded in the ACS.

2. Use of the Pushbutton shall not cause an alarm on the ACS.

3. When a Pushbutton is pressed, the ACS shall unlock the door and shunt the door position. The ACS shall unlock the door and shunt the door position switch.

C. Minimum Specifications:

1. Mounting: Surface as indicated on the Documents

2. Outputs: Momentary/Maintained SPDT/DPDT

D. Acceptable Manufacturers: See Appendix D.

2.11 DOOR POSITION SWITCHES

A. Provide magnetic door position switches to monitor the open/closed status of doors as specified herein and as indicated on the Documents.

B. Concealed Door Position Switch

1. Acceptable Manufacturers: See Appendix D.

C. Surface Mount Door Position Switch

1. Acceptable Manufacturers: See Appendix D.

D. High Security Door Position Switch

1. Acceptable Manufacturers: See Appendix D.

E. Tamper Switch

1. Provide normally closed tamper switches to monitor the secure status of all controllers, power supplies, and power distribution units.

2. Tamper switch shall be provided to monitor AED (Automatic External Defibrillator) device cabinets and AED devices as well as emergency key boxes (KNOX-BOX) enclosures.

3. Mounting: Within cabinet with no outside access to fasteners

4. Acceptable Manufacturers: See Appendix D.

2.12 END-OF-LINE (EOL) RESISTOR

A. The EOL resistor (EOL resistor pack) supervises the wiring between the control panel and the field device and is required for monitoring purposes for all devices in the system.

B. If one detection device is on a single detection circuit, the EOL should be installed at the detection device.

C. If more than one detection device is on a single detection circuit, the EOL shall be installed at the last detection device in the loop.

D. Do not install EOL resistors at the controller or panel location(s).

E. The input circuit shall be monitored by EOL resistors to provide detection of the following states: Fault, FaultCleared, OpenLoop, OpenLoopCleared, CommunicationsFailure and CommunicationsRestored.

a. The Contractor is to use the required EOL resistors for the system being furnished to provide the required four (4) state supervision.

2. Acceptable Manufacturers: See Appendix D.

2.13 MONITORING OF EMERGENCY PUSHBUTTONS

A. The security management system shall provide auxiliary monitoring of the emergency pushbuttons in each elevator. Depending on location, the emergency pushbutton may be part of the elevator intercom device.

B. Provide one (1) pair of terminals per elevator such that when the emergency pushbutton is activated, an event is generated in PACS or VMS.

2.14 SECURITY BARRIERS

A. References

1. The Security Entrance Lane must be UL listed as per UL 2593 – Outline of Investigation for Motor Driven Turnstile Operators and Systems.

2. The Security Entrance Lane must be certified per CAN / CSA - C22.2 no. 247-92 (R 2008) –Standards for Operators and Systems of Obstacles, Gates, Draperies, and Louvers.

B. System Requirements

1. Barrier Arm Optical Turnstile (OT)

a. Barrier Arm Optical Turnstiles shall utilize the building access control system to grant or deny access to the facility and operate with a variety of reader technologies: i.e. proximity, bar code, or biometrics as indicated on the Security Device Drawings.

b. The pedestrian passageway shall always be truly bi-directional and the system will allow each passageway to be accessible in both directions at any given time.

c. The product shall be nonrestrictive to handicapped persons and provide equal access in accordance with The Americans with Disabilities Act of 1990/ADA, and NFPA Life Safety 101.

d. Visual and audible annunciation shall be incorporated into each passageway to provide status of lane, indication of valid card read, alarm condition (with two (2) distinctive audible tones) using vertical (VGA) and horizontal (HGA) graphic arrays.

e. The Barrier Arm OT shall insure that one valid card read allows only one valid entry by using IR sensors to determine the direction of travel

and number of pedestrians passing through the passageway at one time. In the event of unauthorized entry or tailgating, the unit will latch into an alarm condition.

f. All components and electronic sub-assemblies, including the main processing unit controller, shall be designed specifically for the Barrier Arm OT, be solid state in design, and be mounted within the bollards.

g. Pedestrian throughput shall be 50-60 persons per minute, dependent on the card reader technology and the response time of the access control system.

h. Unit shall furnish the following N/O control inputs: Entry Card (Valid Access), Exit Card (Valid Access), Lane Bypass, Invalid Card, Emergency, Arm Disable, Free-exit Enable, Entry Closed and Exit Closed.

i. Unit shall furnish the following N/O status outputs: Alarm Status, Valid Passage, Timeout (after valid card read), Bypass Status and Invalid Card.

j. Barrier Arm OT shall be Electro-Mechanical/Fail-safe in design.

k. Product shall have “Push-to-Emergency-Egress” design built into the barrier arm with force required to push arm away consistent with ADA Specifications.

2. Acceptable Manufacturers: See Appendix D.

PART 3 - EXECUTION

3.1 GENERAL

A. Provide all work as detailed in Section 280000.

3.2 SITE INSPECTIONS

A. Continuously verify that the site conditions agree with the Documents and the design package. Submit a report to the Architect documenting changes to the site or conditions that affect the performance of the System to be installed. For those changes or conditions, which affect System installation or performance, provide (with the report) specification sheets, or written functional requirements to support the findings, and a cost estimate to correct the deficiency. No deficiency shall be corrected without written permission from the Architect.

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

3.3 COORDINATION

A. Coordinate with Project Manager or General Contractor, door hardware vendor and installer, Communications Contractor, Electrical Contractor, Elevator Contractor, HUPD, HU Housing and HUIT to provide a fully functioning Security system.

B. Coordinate with the Architect to ensure that adequate conduit is provided, and that equipment back-boxes are adequate for System installation.

C. Coordinate with the Architect to ensure that adequate power has been provided and properly located for the security System equipment.

D. Coordinate with the Architect to ensure that doors and doorframes are properly prepared for electric locking hardware and door position switches.

E. Coordinate locations of all devices with the Architect and Project Manager prior to installation.

F. Coordinate and verify the location of each piece of rack- and wall-mounted equipment with HUIT. All equipment location in E-MDF and E-IDF shall be strictly followed as indicated in HUIT Div 270000 specifications.

G. Coordinate custom ACS report requirements with HUPD and owner/operator. Submit report formats to the HUPD and owner/operator for review and acceptance.

H. Initial database partitioning and setup shall be completed by Public Safety Systems Team or their partners.

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

1. Provide all initial System programming and setup of the ACS including, but not limited to the following:

a. Graphical Maps and Icons: Coordinate with the Architect to obtain AutoCAD architectural backgrounds for implementation as graphical maps. Import all AutoCAD background information provided by the Architect and produce a complete set of graphical maps depicting all integrated points.

b. ACS Card Reader Information: Coordinate all card reader values and text, nomenclature, descriptions, programming standards, descriptors, alarm messages, camera call up, map call- up, and identification with HUPD and owner/operator.

c. Input and Output Points: Coordinate all input and output priorities and text, such as descriptors, alarm messages, camera call up, and map call up and identification with HUPD and owner/operator.

J. Offline Locks

1. Provide and install all offline locks as described on the drawings and in the specifications.

2. Contractor responsible for all components required to meet the intent of the Schlage ENGAGE environment as controlled by HU Housing ACS.

3.4 INSTALLATION

A. The Contractor shall coordinate with HUIT for connecting to their network as indicated in Appendix A.

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

C. Perform all Work as indicated in the Drawings and Specifications.

D. The Contractor shall install the appropriate cable from the Control Panel to Card readers, door contacts, request-to-exit devices, electric locks at each door and/or gate. The Contractor shall install the appropriate cable from Control Panel to monitoring sensors, AED cabinets, Knox-boxes and tamper switches.

E. All communications and control cables shall be kept away from power circuits.

F. The Contractor shall install the power supply(s) for electric locks in central (MDF or IDF) locations where they will not interfere with other operations. Avoid field installed power supplies.

3.5 ACS CONTROL OF ELEVATORS

A. Designated elevators shall be card reader controlled by the security management system on an individual floor programmable basis allowing the passenger to access only those floors for which their access card is authorized. The security management system shall also provide for card reader control of the elevators on a time programmable basis allowing access to certain floors to be card reader controlled while allowing simultaneous free access to other floors.

B. When an elevator is in the card reader control mode, all the floor select buttons shall be disabled (except for the recall floor). The passenger shall be required to hold their access card up to a card reader mounted in the elevator return panel. Upon a valid card read, the security management system shall enable the floor select buttons for the floor(s) the passenger is authorized to access. The passenger must then push the desired select button. Once the passenger has pushed the button, the elevator control system shall illuminate the button and send the elevator to the selected floor. When an elevator is in the normal mode, all floor select buttons shall be enabled.

C. Provide one (1) pair of terminals per controlled elevator such that a maintained dry contact closure across the terminals by the security management system shall place the elevator in the card reader control mode. The elevator shall remain in the card reader control mode as long as the contact is closed and shall return to the normal mode when the contact opens.

D. Provide one (1) pair of terminals per floor per controlled elevator (except the recall floor) such that a dry contact closure across the terminals by the security management system shall enable the floor select button. The button shall remain enabled for as long as the dry contact is closed.

E. ELEVATOR/ACS INTERFACE

1. Provide an elevator/ACS interface cabinet in each elevator machine room. The interface location shall be confirmed with elevator contractor and code consultant. The interface cabinet shall contain all required interface terminals including, but not limited to:

    a. Card Reader Interface (four (4) conductor per card reader-controlled elevator – contractor to verify cabling requirements for reader prior to installation)

    b. Card Reader Control Mode (one (1) pair per card reader-controlled elevator)

    c. Floor Select Button Enable (one (1) pair per floor per card reader-controlled elevator)

    d. Emergency Pushbutton Monitoring (one (1) pair per elevator)

    e. Hall Call Button Enable (one (1) pair per card reader-controlled hall call button)

    f. Hall Call Button Remote Control (one (1) pair per remote controlled hall call button)

2. Provide a key switch for each elevator to bypass all security control functions.

3. Fireman's override and automatic recall functions shall bypass all security control functions.

F. ELEVATOR SOFTWARE INTEGRATION

1. Use software integration methods for elevator equipment manufacturers that have an integration built in with the access control system.

3.6 ACCESS CONTROL EQUIPMENT

A. Provide equipment as indicated on the Documents and specified herein. Additional specific installation requirements are as follows:

1. Security Equipment Room and IC Locations

    a. Configure security equipment as indicated in the Documents.

    b. Wire each power supply power fail alarm contacts in each equipment room as a separate alarm input to the SMS.

    c. Wire each power supply low battery alarm contact as individual alarm inputs to the SMS.

2. Controllers

    a. Configure the System such that devices can be connected to spare input points, output points and card reader inputs on the controller without needing to fully rewire the panel.

3. Card Readers

    a. Wire card reader LEDs to indicate valid and invalid card reads, and door locked and unlocked conditions. All card reader LED indicators shall operate identically (Steady Red – Locked; Slow Flash red/greed – Unlocked; Fast Flash red/green – Alarm). Coordinate with owner/operator.

4. Electric Locking Mechanisms

    a. Interface with electric locking mechanisms provided by the door hardware supplier.

    b. Wire electric locking mechanisms as indicated on the Documents.

    c. Wire fail-safe electric locking mechanisms in accordance with local codes.

    d. Wire fail-secure electric locking mechanisms and power supplies such that a fire alarm condition or building power failure shall not affect operation of the lock.

5. Delayed Egress Locking Devices

    a. Interface with delayed egress locking devices provided by the door hardware supplier.

    b. Wire delayed egress locking devices as indicated on the Documents.

    c. Wire delayed egress locking devices for fail-safe operation in accordance with local codes.

    d. Interface with a normally closed alarm contacts that shall open upon activation of the unlock timer.

    e. Interface with sounder bypass control contacts. Wire control output contacts to bypass sounder by system workstation.

    f. Interface with lock control contacts activated by system workstation and/or time schedule. Wire control output contacts to lock/unlock devices by time schedule and/or system workstation. Install code required signage for delayed egress openings.

6. Fire Alarm Interface

    a. Connect (hard wire) fail-safe electric and time delay locking mechanical to the building fire alarm System for fail-safe release upon any fire alarm.

    b. Interface with a single low voltage/low current normally closed dry contact from the fire alarm System provided by the fire alarm contractor in the Fire Command Center. The contact shall open on any fire alarm condition.

c. Provide all additional UL listed fail-safe relays and power supplies necessary to interface to this contact and unlock all fail-safe doors.

d. Connect fail-safe relays and power supplies to standard building power. Connection of fail-safe devices to emergency or UPS power shall not be acceptable.

e. Reference the Documents for fire alarm interface requirements.

3.7 SYSTEM PROGRAMMING AND DATA ENTRY

A. Provide all initial system programming and setup of ACS including, but not limited to the following:

1. Graphical Maps and Icons

a. If required by owner/operator - coordinate with Architect to obtain Architectural drawing backgrounds for implementation as graphical maps. Import all background information provided by Engineering drawings and produce a complete set of graphical maps depicting all ACS points.

2. ACS Card Reader Information

a. Coordinate all card reader values and text, including descriptors, alarm messages, CCTV camera call up, map call up and identification with Owner.

3. Input and output points for ACS. Coordinate all input and output priorities and text, including descriptors, alarm messages, CCTV Camera call up, and map call up and identification with HUPD.

4. Initial system users, including levels of access. This shall include designation of Owner’s representative at "Super User" level immediately upon ACS initialization. ACS and user/Administration permissions managed by HUPD.

5. Program Elevator access per cardholder by floor.

6. Initialize administrator interface to allow owner to update or terminate cardholder privileges and update card information.

B. Enter all data required to make Access Control System operational. Deliver data to Owner on data entry forms, utilizing data from Contract Documents, Contractor's field surveys and all or pertinent information in Contractor's possession required for complete installation database. Identify and request from Owner any additional data needed to make Security System fully operational and integrated. Completed forms shall be delivered to Owner for review and approval at least 90 days prior to Contractor's scheduled needed date.

END OF SECTION 281300

SECTION 281500 - SECURITY COMMUNICATION

PART 1 - GENERAL

1.1 GENERAL REQUIREMENTS

A. Applicable requirements of Division 01 - General Requirements and Division 28, Section 280000 shall be considered a part of this section and shall have the same force as if printed herein full.

B. The work to be done under this section of the Specifications shall include the furnishing of labor, material, equipment, and tools required for the complete installation of the work indicated on the Drawings, as specified herein, or as noted in other sections of Division 28 – Electronic Safety and Security.

C. All products not provided by Harvard University shall be new and unused and shall be of manufacturers' current and standard production.

1.2 RELATED SECTIONS

A. Provide the work of this Section in accordance with requirements of the Contract Documents.

B. Comply with requirements of section 280000 - Electronic Safety and Security.

1.3 WORK INCLUDED

A. The Work shall include furnishing all labor, materials, tools and equipment, and documentation required for a complete and working system as specified in this Section. Security Communication System shall consist of all intercom field devices, master stations, controllers, enclosures, towers, stanchions, power supplies and batteries, wiring, conduit systems, software, and all other required appurtenances for a complete working system.

B. The system as described shall be installed, tested, and delivered in working condition. The system will include all required hardware, software, programming and wiring to accomplish the requirements of the specification and contract drawings.

C. All materials furnished will be new and of the latest design available from a manufacturer.

D. While the contract documents identify the location and quantities of equipment for estimating purposes, the installation of all wiring (power, network, audio, video, and control), field devices, and equipment will be based on the complete vendor's/manufacturer's wiring diagrams and equipment layouts as approved for this project. The Contractor, prior to installation, shall submit the design documents for approval.

E. The Contractor shall coordinate system operational requirements and integration with HUIT and HUPD.

F. The Contractor shall provide a complete system design based on the requirements as set forth in the contract documents. Provide integration with the access control system, and video surveillance system.

G. The network-based system shall leverage the HUIT network infrastructure for system communications Refer to Section 280000 for exact submittal requirements and schedule required for proper SCS operation.

1. Refer to Harvard University Division 270000 standards and specifications for scope delineation between work performed by telecommunications and security contractor. Below is a list of scope performed by HUIT and Division 27 contractor:

a. HU Enterprise LAN and WAN network for SCS use.

b. HU or Verizon analog voice circuits.

c. All horizontal and backbone LAN cabling and patch cords required for VMS operation.

d. All active LAN components, including switches, routers, firewalls and UPS required for VMS operation.

e. All logical network provisioning (IP addresses, MAC registrations) required for VMS operation.

H. The Work to be provided, in addition to furnishing and installing the SCS, shall include the following:

1. Coordinate all stanchion and tower locations with HUIT, HUPD and Architect prior to rough-in of any back-boxes and conduits.

2. Provide software that meets specified contract requirements.

3. Installation, set-up, and programming of SCS server, if applicable, and any related ancillary equipment.

4. Verification that proposed equipment and devices furnished are adequate and well suited for the intended purpose.

5. Perform a layout check to ensure that adequate access is available for construction, installation, and maintenance of equipment and devices furnished; however, the Contractor is not responsible for furniture.

6. Perform acceptance tests to show system is properly installed and that it meets the specifications and applicable codes.

7. SCS system administration shall be by Harvard University. The System Administrator shall be responsible to maintain the system after system acceptance.

PART 2 - PRODUCTS

2.1 BLUE LIGHT EMERGENCY TERMINALS AND STANCHIONS

A. All Blue Light Emergency towers and associated communications devices that are part of the tower shall be furnished by HUIT and installed by the Telecommunications contractor.

B. Acceptable Manufacturers: See Appendix D.

2.2 SECURITY BUILDING INTERCOM

A. All Intercom master stations, voice-only door stations, video door stations shall be IP enabled.

B. A network-based communication and security system featuring video entry security and internal communication, All units and app in the systems shall be able to unlock doors remotely on a network, assist onsite visitors from an offsite location and communicate using a PoE network.

1. Power Source: Power over Ethernet (802.3af).
2. Network Interface: 10 BASE-T / 100 BASE-TX Ethernet (RJ-45).
3. Network Protocols: IPv4, IPv6, TCP, UDP, SIP, HTTP, HTTPS, MJPEG, RTSP, RTP, RTCP, IGMP, MLD, SMTP, DHCP, NTP, DNS.
    a. All intercom devices shall operate in unicast mode (multicast not allowed).
4. Bandwidth Usage:
    a. G.711: 64Kbps x 2 per video call.
    b. 64Kbps per monitor.
    c. H.264: 24Kbps ~ 2,048Kbps.
5. Communication: Hands-free (VOX), push-to-talk (simplex), or handset (full-duplex).
6. Video Display: 7-inch color LCD.
7. Camera: Type:
    a. 1/3-inch color CMOS. 1.23 Megapixels.
    b. View Area at 0-degree camera angle mounted at 4 feet 11 inches AFF: 2 feet 3 inches vertical x 3 feet 9 inch horizontal at 19 inches.
8. Video Stream: ONVIF Profile S.
9. Door Release: Programmable Form C dry contact, 24V AC/ DC, 1A

C. Acceptable Manufacturers: See Appendix D

PART 3 - EXECUTION

3.1 GENERAL

A. Provide necessary work as detailed in Section 280000.

3.2 SITE INSPECTIONS

A. Continuously verify that the site conditions agree with the Documents and the design package. Submit a report to the Architect documenting changes to the site or conditions that affect the performance of the System to be installed. For those changes or conditions, which affect System installation or performance, provide (with the report) specification sheets, or written functional requirements to support the findings, and a cost estimate to correct the deficiency. No deficiency shall be corrected without written permission from the Architect.

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

3.3 COORDINATION

A. Coordinate with the Architect to ensure that adequate conduit is provided, and that equipment back-boxes and footings are adequate for system installation. Contractor to provide landscape contractor with appropriate mounting bolts and templates upon request prior to installation.

B. Coordinate with the Architect to ensure that adequate power has been provided and properly located for the security System equipment.

C. Coordinate locations of all devices with the Architect prior to installation.

D. Coordinate and verify the location of each piece of rack-mounted equipment with the HUIT and HUPD.

E. Coordinate all initial setup and call routing with HUIT and HUPD prior to initial programming and cardholder data entry.

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

3.4 INSTALLATION

A. Provide equipment as indicated on Drawings and specified herein.

B. Provide all initial System programming and setup of the SCS including, but not limited to the following:

1. Initial setup for the interface with the ACS and VMS. The interface shall provide for automatic camera selection upon alarms within the SCS as defined in the specification.

2. Graphical Maps and Icons: Coordinate with the Architect to obtain AutoCAD · architectural backgrounds for implementation as graphical maps. Import all AutoCAD background information provided by the Architect and produce a complete set of graphical maps depicting all SCS points.

    a. Coordinate with HUIT to obtain requirements for ArcGIS system for implementation as graphical maps. All exterior CCTV camera locations shall be documented in HU ArcGIS portal. Data entry into ArcGIS shall be by HUIT. Contractor shall provide all required information, including the following: exact location, type and model, connectivity method, field-of-view coverage and other info as required by HU.

3. On-screen alphanumeric identification of each intercom device. Coordinate descriptors with HUPD and HUIT prior to programming.

4. Automatic selection of a camera adjacent to an Intercom device upon a call initiation. Coordinate automatic camera selection requirements with HUPD and HUIT prior to system programming.

5. Program call routing from each device to designated master station, as indicated on drawings. The call routing is basis of design. Final coordination with HUPD and HUIT is required for accurate and complete call routing programming prior to completion of work.

6. Provide and configure all licensing required for system operation as well as integration licensing to other systems, including but not limited to ACS, VMS, HUIT IP telephone system, Verizon analog voice circuits.

C. Enter all data needed to make the SCS operational. Deliver the data to HUIT on data entry forms, utilizing data from the Documents, Contractor's field surveys and all other pertinent information in the Contractor's possession required for complete installation of the database. Identify and request from the Architect any additional data needed to make the SCS fully operational and integrated. The completed forms shall be delivered to HUPD and HUIT for review and approval at least 90 days prior to the Contractor's scheduled date.

END OF SECTION 281500

SECTION 281600 - INTRUSION DETECTION

PART 1 - GENERAL

1.1 GENERAL REQUIREMENTS

A. Applicable requirements of Division 01 - General Requirements and Division 28, Section 280000 shall be considered a part of this section and shall have the same force as if printed herein full.

B. The work to be done under this section of the Specifications shall include the furnishing of labor, material, equipment, and tools required for the complete installation of the work indicated on the Drawings, as specified herein, or as noted in other sections of Division 28 – Electronic Safety and Security.

C. All products not provided by Harvard University shall be new and unused and shall be of manufacturers' current and standard production.

1.2 RELATED SECTIONS

A. Provide the work of this Section in accordance with requirements of the Contract Documents.

B. Comply with requirements of section 280000 - Electronic Safety and Security.

1.3 WORK INCLUDED

A. This Section describes the Intrusion Detection System (IDS), including installation of all field devices, control panels, enclosures, network equipment, power supplies, wiring, software, and all other required appurtenances for a complete working system.

B. The system as described shall be installed, tested, and delivered in working condition. The system shall include all required hardware, software, programming and wiring to accomplish the requirements of the specification and contract drawings.

C. All materials furnished shall be new and of the latest design available from a manufacturer.

D. While the contract documents identify the location and quantities of equipment for estimating purposes, the installation of all wiring (power, network, communication and control), field devices, and equipment will be based on the complete vendor's/manufacturer's wiring diagrams and equipment layouts as approved for this project. Refer to section 280000 for shop drawing submittal requirements.

E. The Contractor shall coordinate all system operational requirements and integration with other security systems, HUPD, HUIT and owner/operator.

F. The Contractor shall provide a complete system design based on the requirements as set forth in the contract documents. Provide integration with the access control system and video surveillance system.

G. Furnish and install a complete microprocessor controlled, detection, notification and control devices as described herein and shown on the plans. The system shall

include a central control panel and include all necessary boards, power supplies, master control stations, substations, network interface boards, special mounting boxes, terminal boards, cable, connectors, and accessories for a complete operational communication system.

H. The IDS system shall communicate all alarms to HUPD existing monitoring system via an IP-based SIA DC-09 protocol. The system shall be provided with back-up cellular communication modules at each panel.

I. The work to be provided, in addition to furnishing and installing the IDS, shall include the following:

1. Coordinate all duress call buttons, detection devices and keypads with HUPD and owner/operator prior to installation.

2. If required - integrate IDS system with access control system (ACS) for alarm condition reset. Coordinate with HUPD and owner/operator.

3. Provide software that meets specified contract requirements.

4. Installation, set-up, and programming of IDS panel, and any related ancillary equipment.

5. Verification that proposed equipment and devices furnished are adequate and well suited for the intended purpose.

6. Perform a layout check to ensure that adequate access is available for construction, installation, and maintenance of equipment and devices furnished; however, the Contractor is not responsible for furniture or millwork.

7. Perform acceptance tests to show system is properly installed and that it meets the specifications and applicable codes.

8. IDS system administration shall be by Harvard University. The System Administrator shall be responsible to configure and maintain the system after system acceptance. System utilities shall be provided for the System Administrator to use.

9. All IDS users and administrators shall be programmed into the system prior to owner/operator acceptance.

PART 2 - PART 2 - PRODUCTS

2.1 GENERAL

A. All products provided by the Contractor shall be new and unused and shall be of manufacturers' current and standard production.

B. Where two or more equipment items of the same kind are provided, all shall be identical and provided by the same manufacturer.

2.2 IDS CONTROLLERS

A. Acceptable Manufacturers: See Appendix D.

2.3 IDS EQUIPMENT

A. Communication Accessories

1. Cellular Communicators: See Appendix D

B. Control Panel

1. LCD Keypad: See Appendix D

C. Intrusion/Field Devices

1. Duress Button – Wall mounted: the unit consists of a housing that contains the electrical circuitry and contacts, a cover plate to protect the internal electronics.

a. Nominal Voltage: 12 V DC @ 6 mA

b. Current: Max 8 mA

c. Operational Voltage: 7 V DC to 15 V DC

d. Configuration: SPDT

e. Acceptable Manufacturers: See Appendix D.

2. Duress Button-Under desk mounted: the unit consists of a housing that contains the electrical circuitry, a cover plate to protect the internal electronics and a plunger type actuating button.

a. Nominal Voltage: 12 V DC @ 6 mA

b. Current: Max 0.2A

c. Operational Voltage: 7 V DC to 15 V DC

d. Configuration: DPDT

e. Acceptable Manufacturers: See Appendix D.

3. Audible Alarm: A heavy duty self-contained siren speaker shall contain mylar diaphragm speaker with 2-chanel siren driver. The cover shall be impact resistant.

a. Output at 10 feet: 12 volts- 101dB

b. Frequency Range: 700-2000Hz

c. Current Drain: 12V-0.350amp

d. Acceptable Manufacturers: See Appendix D.

4. Accessories

a. Power Supply.

D. END-OF-LINE (EOL) RESISTOR

1. The EOL resistor (EOL resistor pack) supervises the wiring between the control panel and the field device and is required for monitoring purposes for all devices in the system.

2. If one detection device is on a single detection circuit, the EOL should be installed at the detection device.

3. No more than one detection device shall be permitted on a single detection circuit.

4. Do not install EOL resistors at the controller or panel location(s).

5. The input circuit shall be monitored by EOL resistors to provide detection of the following four (4) states:

a. Normal

b. Alarm

c. Open

d. Short

1) The Contractor shall use the required EOL resistors for the system being furnished to provide the required four (4) state supervision.

PART 3 - EXECUTION

3.1 GENERAL

A. Provide necessary work as detailed in Section 280000.

3.2 SYSTEM PROGRAMMING AND DATA ENTRY

A. Provide all initial System programming and setup of the IDS including, but not limited to the following:

1. Initial setup for the interface with Central Monitoring Station.

2. Load the entire initial user database into all programmable systems up to the inaugural day of beneficial use of the IDS. The Owner shall assist in establishing procedural guidelines and in defining terminology and conditions unique to the Owner's operation.

3. Provide training to facility personnel.

B. Enter all data needed to make the Intrusion Detection System operational. Deliver the data to the Owner on data entry forms, utilizing data from the Documents, Contractor's field surveys and all other pertinent information in the Contractor's possession required for complete installation of the database. Identify and request from the Architect any additional data needed to make the IDS fully operational and integrated. The completed forms shall be delivered to the Owner for review and approval at least 90 days prior to the Contractor's scheduled date.

END OF SECTION 281600

SECTION 282300 - VIDEO SURVEILLANCE

PART 1 - GENERAL

1.1 GENERAL REQUIREMENTS

A. Applicable requirements of Division 01 - General Requirements and Division 28, Section 280000 shall be considered a part of this section and shall have the same force as if printed herein full.

B. The work to be done under this section of the Specifications shall include the furnishing of labor, material, equipment, and tools required for the complete installation of the work indicated on the Drawings, as specified herein, or as noted in other sections of Division 28 – Electronic Safety and Security.

C. All products not provided by Harvard University shall be new and unused and shall be of manufacturers' current and standard production.

1.2 RELATED SECTIONS

A. Provide the work of this Section in accordance with requirements of the Contract Documents.

B. Comply with requirements of section 280000 - Electronic Safety and Security.

C. Appendix B – HU Policy on Installation and Use of Video Cameras (latest version)

D. Appendix F - HU Security Systems Cyber Hardening Guidelines

1.3 WORK INCLUDED

A. This Section describes the network-based digital video surveillance system, including installation of all monitors, cameras, network recording units, network equipment, encoders and decoders, power supplies, wiring, conduit systems, software, and all other required appurtenances for a complete working system:

B. The system as described shall be installed, tested, and delivered as per contractual agreement. The system shall include all required hardware, software, programming and wiring to accomplish the requirements of the specification and contract drawings.

C. All materials furnished shall be new and of the latest design available from a manufacturer, with the latest software and firmware revisions installed, unless otherwise agreed by HU.

D. While the contract documents identify the location and quantities of equipment for estimating purposes, the installation of all wiring (power, network, video, and control), field devices, and equipment will be based on the complete vendor's/manufacturer's wiring diagrams and equipment layouts as approved for this project. The Contractor, prior to installation, shall submit the design documents for approval.

E. The Contractor shall coordinate system operational and video storage requirements with the Harvard University. HU operates central VMS recording system – xProtect VMS by Milestone Systems, at an off-campus data center, located at HU hosting

facility. Coordinate VMS head-end location with other HU departments. Contractor shall provide total project video storage capacity requirements to HUIT halfway through the construction process (include model number and storage capacity in Terabytes, form factor and power requirements).

F. Contractor shall be responsible for all NVR upgrades based on project requirements, including but not limited to storage capacity upgrades, NVR upgrades, SAN upgrades, software, and licensing upgrades.

G. The Contractor shall provide a complete system design based on the requirements as set forth in the contract documents and division specifications.

H. Refer to Section 280000 for exact submittal requirements and schedule required for proper video management system operation.

1. Refer to HUIT Division 270000 standards and specifications for scope delineation between work performed by telecommunications and security contractor. Below is an example of scope items performed by HUIT and Division 27 contractor:

a. HU Enterprise LAN and WAN network for CCTV use.

b. All horizontal and backbone LAN cabling and patch cords required for VMS operation.

c. All active LAN components, including switches, routers, firewalls and UPS required for VMS operation.

d. All logical network provisioning (IP addresses, MAC registrations) required for VMS operation.

I. The work to be provided, in addition to furnishing and installing the VMS, shall include the following:

1. Provide complete system design and engineering.

2. Installation, set-up, and programming of indoor and outdoor CCTV cameras, VMS server, storage, and any related ancillary equipment provided shall be by the contractor.

3. Verification that proposed equipment and devices furnished are adequate and well suited for the intended purpose as indicated in Appendix C and or as agreed with HU.

4. Perform a layout check to ensure that adequate access is available for construction, installation, and maintenance of equipment and devices furnished.

5. Perform acceptance tests during daytime and nighttime to show system is properly installed and that it meets the specifications and applicable codes.

6. VMS and CCTV cameras are configured with accounts, access, and permissions to allow full and independent administration by HU according to naming and standards defined and approved by HU.

PART 2 - VIDEO MANAGEMENT SYSTEM (VMS)

2.1 VIDEO MANAGEMENT SYSTEM

A. HU owns and operates different VMS platforms at different schools and departments. See Appendix D for manufacturers and models.

B. All NVRs shall communicate with HUPD Milestone Hub.

1. NVRs located at non-University domains require additional Interconnect license in order to be accessible from HUPD Hub.

2.2 NETWORK VIDEO RECORDERS

A. Acceptable Manufacturers: See Appendix D.

1. NVR shall be provided with Enterprise server license expansion

2. NVR storage shall be configured for RAID. Vendor must propose and receive approval for RAID type and size before purchase or configuration of NVR. Preferred configuration is RAID-10 for the Operation System and RAID-5 for data files with a global hot spare disk.

3. Coordinate all NVR installation requirements within the Data Center, including but not limited to rack locations and space within rack, power requirements and networking requirements.

2.3 CCTV SECURITY NETWORK CAMERAS

A. Acceptable Manufacturers: See Appendix D.

B. Each project may require different camera technologies and capabilities. It shall be the responsibility of the security designer to specify cameras that fit specific requirements.

C. All camera Requirements:

1. Provided with smoked or clear domes for interior cameras.

2. Support H.265, H.264 and MJPEG codecs simultaneously.

3. Provides with housings and mounts suitable for installation environment. Coordination required with Architect for color selection and field color modifications per project.

4. Be fully PoE powered.

5. Have a minimum resolution of 1080p. Maximum resolution shall be dictated by project requirements.

6. Have infrared emitters which will adequately illuminate the field of view. Emitters shall be built into the camera for any install location which may experience low light or darkness.

7. Have the capability to remotely apply firmware and software updates and remotely manage and monitor outside of the VMS system environment.

8. Be capable of running the following suite of AI and ML analytics at the camera edge: object classification, loitering detection, crossline detection, tailgating detection, PPE monitoring

9. Be capable of accepting microSDXC cards for edge storage. Use of cards shall be project specific and must be coordinated during project design.

D. All CCTV security cameras shall be recorded on VMS platform at Science Center data center based on following parameters:

1. Minimum video retention rate – 30 days, first-in-first-out.

2. Resolution – Maximum resolution of each specified camera .

3. Video compression –H.265– primary, H.264 – compatibility mode, MJPEG – per project-specific use case.

4. Minimum Frame rate – 10 frames per second for H.264; 7 frames per second for MJPEG.

5. Recording time – 24/7 continuous recording or motion-based recording. Coordinate with Owner.

6. All cameras shall support configurable bitrate and frame rate settings to optimize bandwidth and storage capacity.

E. CCTV CAMERA SURGE PROTECTION

1. Acceptable Manufacturers: See Appendix D

2. All exterior mounted cameras must be provided with data line surge suppressing device.

F. CCTV CAMERA PoE INJECTORS

1. Use of PoE injectors to power CCTV cameras may be approved on case-by-case basis.

2. PoE injectors may be placed near network switch or near a CCTV camera. All PoE injector locations shall be coordinated with HUIT.

3. Locations of all PoE injectors shall be clearly documented on as-built drawings.

PART 3 - PART 3- EXECUTION

3.1 GENERAL

A. Provide all work as detailed in Section 280000.

3.2 SITE INSPECTIONS

A. Continuously verify that the site conditions agree with the Documents and the design package. Submit a report to the Architect documenting changes to the site or conditions that affect the performance of the System to be installed. For those changes or conditions, which affect System installation or performance, provide (with the report) specification sheets, or written functional requirements to support the findings, and a

cost estimate to correct the deficiency. No deficiency shall be corrected without written permission from the Architect.

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

3.3 COORDINATION

A. All CCTV camera exact mounting locations shall be coordinated with general contractor, electrical contractor, Architect, HUPD and HUIT prior to camera backbox and conduit rough-in. This coordination shall take into the account anticipated field of view, required areas to be captured by CCTV camera and any anticipated obstructions (trees, future signage, etc.). Final field of view from each camera shall be reviewed by and signed off by HU project manager and/or HUPD prior to completion of work by the contractor.

B. Coordinate with the Architect to ensure that adequate conduit is provided, and that equipment back-boxes are adequate for system installation.

C. Coordinate with the Architect to ensure that adequate power has been provided and properly located for the security System equipment.

D. Coordinate locations of all devices with the Architect prior to installation.

E. Coordinate and verify the location of each piece of rack-mounted equipment with the HUIT and/or HUPD.

F. Coordinate all initial configuration and setup, including but not limited to, database partitioning, alerting, system defaults, user roles, groups and accounts and other system parameters and configurations with HUIT and/or HUPD prior to any programming, configuration, or data entry.

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

3.4 INSTALLATION

A. Installation shall not proceed until all specifications, configurations and settings are provided and agreed upon by HU.

B. Provide equipment as indicated on Drawings and specified herein.

C. Provide all initial VMS System programming and setup, after coordination with and approval by HUIT. VMS programming and setup may include integration with an ACS and would therefore include additional setup and configuration including, but not limited to the following:

1. Initial setup and/or integration for the interface with ACS. The interface shall provide for automatic camera selection upon alarms within ACS as defined in the Specifications. Coordinate automatic camera selection, real-time record

initialization, and recording status alarm annunciation requirements with HUPD, HUIT or the Customer / Owner operator prior to programming.

2. Graphical Maps and Icons: Coordinate with the Architect to obtain AutoCAD architectural backgrounds for implementation as graphical maps. Import all AutoCAD background information provided by the Architect and produce a complete set of graphical maps depicting all VMS points.

    a. Coordinate with HUIT and HUPD to obtain requirements for ArcGIS system for implementation as graphical maps. All exterior CCTV camera locations shall be documented in HU ArcGIS portal. Data entry into ArcGIS shall be by HUIT. Contractor shall provide all required information, including the following: exact location, type and model, connectivity method, field-of-view coverage and other info as required by HU.

3. On-screen alphanumeric identification of each camera. Coordinate descriptors with HUPD and HUIT prior to programming.

4. Automatic selection of a camera adjacent to a Card Reader upon an invalid card use. Coordinate automatic camera selection requirements with HUPD, HUIT and local IT groups prior to system programming.

5. Automatic switching of recording from standby or reduced frame rate mode to real increased frame rate recording when an alarm occurs as defined herein.

6. Configure each camera’s parameters – resolution, frame rate, compression, password, and network ports, etc. Coordinate all parameters with HUPD and HUIT.

7. All cameras mounted in acoustic ceiling tiles shall be appropriately secured with jack chain or similar product approved by AHJ.

D. Enter all data needed to make the VMS operational. Deliver the data to HUIT on data entry forms, utilizing data from the Documents, Contractor's field surveys and all other pertinent information in the Contractor's possession required for complete installation of the database. Identify and request from the Architect any additional data needed to make the VMS fully operational and integrated. The completed forms shall be delivered to HUPD and HUIT for review and approval at least 90 days prior to the Contractor's scheduled date.

E. Camera Programing Matrix

1. CCTV Programing Matrix is provided as a sample. Completion of this table is to be completed by the contractor and coordinated with HUIT and HUPD.

2. Sample Programing Matrix:

CCTV Programing Matrix				
Camera #	***Alarm Type***	***Event***	***Recording Length***	***Coordinated Action***
CAM-XX-XXX	Door Alarm	Door Forced	Designated Record Time	Display video from camera CAM-XX-XXX on Monitor 5 in Public Safety
	Invalid Card	An invalid card is presented at a reader	Designated Record Time	Display video from camera CAM-XX-XXX on Monitor 5 in Public Safety
	Video Loss	Video/Data stream not available	N/A	Display Event in Public Safety, Email Alert.
	Motion	Person entering or leaving camera field of view	Designated Record Time	Display video from camera CAM-XX-XXX on Monitor 5 in Public Safety
Note: This matrix has been provided as a sample of what should be included in the submittal package. Contractor shall provide complete programing matrix filled out per the HUIT and HUPD requirements as a part of the submittal package.				

END OF SECTION 282300

APPENDIX A
HARVARD UNIVERSITY INFORMATION TECHNOLOGY (HUIT) RULES OF THE ROAD FOR INTEGRATORS AND INSTALLERS

A. It shall be the responsibility of the Security Contractor to obtain the link to, or a copy of the HUIT Rules of the Road for Integrators and Installers document from the HUIT Project Manager.

B. In order to ensure compliance – all Contractors must reference Harvard University Network Access Rider.

1. File Link: https://enterprisearchitecture.harvard.edu/sites/g/files/omnuum10526/files/enterprise/files/rider_network_access_5.19.21.pdf

APPENDIX B
POLICY ON INSTALLATION AND USE OF VIDEO CAMERAS

A. Latest version of APPENDIX B must be downloaded from HU ShareFile location. If the link to the ShareFile is not functional – it shall be the responsibility of the Security Contractor to obtain latest version of "***Policy on Installation and Use of Video Cameras***" from HUIT project manager.

1. ShareFile Link: https://provost.harvard.edu/files/provost/files/final_video_camera_policy_may_25_2016.pdf

APPENDIX C
HARVARD UNIVERSITY SECURITY SYSTEMS COMMISSIONING REQUIREMENTS

HARVARD
UNIVERSITY

Information Technology

SECURITY SYSTEMS COMMISSIONING REQUIREMENTS PROTOCOL

	NAME AND TITLE (PRINTED)	SIGNATURE	DATE
PREPARED BY:			
REVIEWED AND APPROVED BY:			

SECTION 1.0 INTRODUCTION

1.1 OBJECTIVE

The objective of this commissioning protocol is to gather and document evidence that the new security system installed at the Harvard University (Facility Name) _____ located at (address)_____ meets defined operational requirements and the acceptance criteria specified in this document.

1.2 RESPONSIBILITIES

A. **Company Name_____ (Commissioning Agent)**

The Company Name Inc., (Company abbreviation), is responsible for the following activities:

1. Preparing a draft test protocol of security systems for Owner review and comment.
2. Incorporating any redline comments, as required.
3. Submitting a printed copy and electronic media of the approved document.
4. Planning and attending a number (as per contractual obligation) of project meetings at the site.
5. Providing meeting minutes for the project meetings.
6. Providing Security Systems installation review.
7. Clarifying design intent as required.
8. Performing functional testing of the security related systems with contractor assistance.
9. Documenting the results of functional testing including major deficiencies that require corrective action by applicable contractors.

B. **Harvard University (Owner)**

The Owner is responsible for the following activities:

1. Attending the project meeting.
2. Providing redline comments, as required, for approval of test procedures.
3. Reviewing and approving the required documentation.
4. Allowing access to the site and security systems for preparation of testing and implementation.
5. Providing personnel assistance for testing.
6. Providing comments on current security system issues.
7. Providing recordings from each camera for the Commissioning Agent review and examination of camera performance under varying light conditions during a 24 hour period.

C. **Company Name_____ (Owner's Representative)**

The (Owners Representative Name) is responsible for the following activities:

1. Attending the project meeting.
2. Providing redline comments, as required, for approval of test procedures.
3. Coordinating review and approval of the protocol documentation with owner and contractor.
4. Coordinating access for the Commissioning Agent to the site and security systems for preparation of testing and implementation.
5. Coordinating contractor, GC and owner personnel assistance for testing.

D. **Company Name _____ (System Installer)**

The (Company Name) is responsible for the following activities:

1. Attending the project meetings.
2. Provide a list of each device, including model numbers, MAC addresses and IP addresses.
3. Provide approved product submittals for review and comment.

4. Compiling manuals and other documentation required for the development and implementation of test procedures.
5. Providing subcontractor personnel and test equipment necessary for functional test implementation.
6. Providing assistance to access exterior and interior cameras for inspections.
7. Resolving test deficiencies discovered during protocol implementation. (Owner or owner's Representative to issue resolution timeframe for completion.)
8. Providing As-Built documents for project close out.
9. Providing System Installer completed QA/QC or test/system testing check lists.
10. Providing all Operation and Maintenance manuals.

E. **Company Name Inc. _____ (System Manufacturer)**

The (Company Name Inc.) is responsible for the following activities:

1. Providing technical support assistance to installer/contractor (Company Name) personnel during access control system operational testing procedures.
2. Providing technical support assistance to installer/contractor (Company Name) personnel for system programming sequences and customer training.

SECTION 2.0 INSTALLATION VERIFICATION

2.1 DESCRIPTION

This commissioning protocol documents that the security equipment has been installed according to the manufacturer's recommendations, engineering design drawings, engineering specifications, and approved contractor submittals. Any deficiencies encountered during installation verification shall be reported to the commissioning team to determine remediation.

Installation verification shall be completed prior to any functional performance testing. Successful completion indicates that the system has been installed as designed and specified, but does not qualify that the system is capable of operation as specified.

2.2 SOFTWARE

Verify the installation of the following software via visual observations and functional checklist by access of security systems software from Owner's security workstation.

1. Access Control System. System name/version: _____
2. Video Management System. System name/version: _____
3. Intrusion Detection System. System name/version: _____
4. Communication System/s. System name/version: _____

2.3 TOOLS AND INSTRUMENTS

The following are tools and instruments that may be required to perform testing:

1. An 8' ladder and extension ladder for accessing interior and exterior cameras for inspection. Ladders shall be provided by GC or Installation Contractor onsite.
2. Access control card with full access rights to all doors for testing card readers – provided by Owner or Installation Contractor.

2.4 EQUIPMENT

Verify the installation of the following equipment via visual observations and functional checklists.

A. CCTV Camera Installation Checklist

Verify that the following conditions are satisfied. Total (##) locations based on issued project drawings.

1. Visually verify all connections for secure connectivity.

2. Visually verify there is no damage or wear to the camera.
3. Visually verify camera housing for leaks.
4. Visually verify mounting points for secure fit/mounting.
5. Visually verify network switch connectivity.
6. Visually verify exterior camera are installed with heaters and fans (if applicable).
7. Items noted as “Fail” require correction by the installing contractor to provide specified functionality.

	Camera Location	MAC & IP Addresses	Model/Type	Installation Checklist Item						Comments
				1	2	3	4	5	6	
				Connectivity	Damage/ Wear	Housing	Mounting	Field of View	Heater/ Blower	
1				☐ Pass ☐ Fail ☐ N/A	☐ Pass ☐ Fail ☐ N/A	☐ Pass ☐ Fail ☐ N/A	☐ Pass ☐ Fail ☐ N/A	☐ Pass ☐ Fail ☐ N/A	☐ Pass ☐ Fail ☐ N/A	
2				☐ Pass ☐ Fail ☐ N/A	☐ Pass ☐ Fail ☐ N/A	☐ Pass ☐ Fail ☐ N/A	☐ Pass ☐ Fail ☐ N/A	☐ Pass ☐ Fail ☐ N/A	☐ Pass ☐ Fail ☐ N/A	
3				☐ Pass ☐ Fail ☐ N/A	☐ Pass ☐ Fail ☐ N/A	☐ Pass ☐ Fail ☐ N/A	☐ Pass ☐ Fail ☐ N/A	☐ Pass ☐ Fail ☐ N/A	☐ Pass ☐ Fail ☐ N/A	
4				☐ Pass ☐ Fail ☐ N/A	☐ Pass ☐ Fail ☐ N/A	☐ Pass ☐ Fail ☐ N/A	☐ Pass ☐ Fail ☐ N/A	☐ Pass ☐ Fail ☐ N/A	☐ Pass ☐ Fail ☐ N/A	
5				☐ Pass ☐ Fail ☐ N/A	☐ Pass ☐ Fail ☐ N/A	☐ Pass ☐ Fail ☐ N/A	☐ Pass ☐ Fail ☐ N/A	☐ Pass ☐ Fail ☐ N/A	☐ Pass ☐ Fail ☐ N/A	
	Checklist Completed By									Date

B. Access Controlled, Monitored and Electrified Openings Installation Checklist

Verify that the following conditions are satisfied. Total (#) of openings shall be based on issued project drawings.

1. Visually verify all accessible wiring connections for secure connectivity.
2. Visually verify the device is new and there is no damage or wear to the device.
3. Visually verify device housing for leaks.
4. Verify device mounting points for secure fit/mounting.
5. Visually verify that tamper proof security screws have been installed.
6. Visually verify there are not accessible gaps to lock mechanism, strike plates installed (if applicable).
7. Visually verify that Access control panel has the following installed: tamper contacts, batteries, battery charge monitoring, power monitoring, key cylinder on door panel.
8. Verify and record Access Control Panel Mac address and IP address for record.
9. Items noted as “Fail” require correction by the installing contractor to provide specified functionality.

	Opening #:	Opening Type	Installation Checklist Item					Comments
			1	2	3	4	5	
			Connectivity	Damage/ Wear	Box/Conduit	Mounting	Tamper Screws	
1			☐ Pass ☐ Fail ☐ N/A	☐ Pass ☐ Fail ☐ N/A	☐ Pass ☐ Fail ☐ N/A	☐ Pass ☐ Fail ☐ N/A	☐ Pass ☐ Fail ☐ N/A	
2			☐ Pass ☐ Fail ☐ N/A	☐ Pass ☐ Fail ☐ N/A	☐ Pass ☐ Fail ☐ N/A	☐ Pass ☐ Fail ☐ N/A	☐ Pass ☐ Fail ☐ N/A	
3			☐ Pass ☐ Fail ☐ N/A	☐ Pass ☐ Fail ☐ N/A	☐ Pass ☐ Fail ☐ N/A	☐ Pass ☐ Fail ☐ N/A	☐ Pass ☐ Fail ☐ N/A	

4			☐ Pass ☐ Fail ☐ N/A	☐ Pass ☐ Fail ☐ N/A	☐ Pass ☐ Fail ☐ N/A	☐ Pass ☐ Fail ☐ N/A	☐ Pass ☐ Fail ☐ N/A	
5			☐ Pass ☐ Fail ☐ N/A	☐ Pass ☐ Fail ☐ N/A	☐ Pass ☐ Fail ☐ N/A	☐ Pass ☐ Fail ☐ N/A	☐ Pass ☐ Fail ☐ N/A	
Checklist Completed By								**Date**

C. Intrusion Detection System Installation Checklist

Verify that the following conditions are satisfied. Total (#) of devices shall be based on issued project drawings.

1. Visually verify all accessible wiring connections for secure connectivity.
2. Visually verify the device is new and there is no damage or wear to the device.
3. Verify device mounting points for secure fit/mounting.
4. Visually verify that tamper proof security screws have been installed.
5. Items noted as “Fail” require correction by the installing contractor to provide specified functionality.

	Device # and Location:	**Device Model #**	**Installation Checklist Item**					**Comments**
			1	**2**	**3**	**4**	**5**	
			Connectivity	**Damage/ Wear**	**Box/Conduit**	**Mounting**	**Tamper Screws**	
1			☐ Pass ☐ Fail ☐ N/A	☐ Pass ☐ Fail ☐ N/A	☐ Pass ☐ Fail ☐ N/A	☐ Pass ☐ Fail ☐ N/A	☐ Pass ☐ Fail ☐ N/A	
2			☐ Pass ☐ Fail ☐ N/A	☐ Pass ☐ Fail ☐ N/A	☐ Pass ☐ Fail ☐ N/A	☐ Pass ☐ Fail ☐ N/A	☐ Pass ☐ Fail ☐ N/A	
3			☐ Pass ☐ Fail ☐ N/A	☐ Pass ☐ Fail ☐ N/A	☐ Pass ☐ Fail ☐ N/A	☐ Pass ☐ Fail ☐ N/A	☐ Pass ☐ Fail ☐ N/A	
4			☐ Pass ☐ Fail ☐ N/A	☐ Pass ☐ Fail ☐ N/A	☐ Pass ☐ Fail ☐ N/A	☐ Pass ☐ Fail ☐ N/A	☐ Pass ☐ Fail ☐ N/A	
5			☐ Pass ☐ Fail ☐ N/A	☐ Pass ☐ Fail ☐ N/A	☐ Pass ☐ Fail ☐ N/A	☐ Pass ☐ Fail ☐ N/A	☐ Pass ☐ Fail ☐ N/A	
Checklist Completed By								**Date**

SECTION 3.0 OPERATIONAL QUALIFICATION

3.1 DESCRIPTION

This section of the commissioning protocol documents evidence that the Owner’s Security System performs as intended throughout specific operational ranges and functions. Tests that may interfere with subsystem tests during commissioning are excluded. Controls are adjusted during this phase of testing and performance trials are conducted to verify that the system operates in accordance with design specifications. During testing, data is collected concerning critical processing parameters that could affect operation.

3.2 TOOLS AND INSTRUMENTS

The following are tools and instruments that may be required to perform testing:

A. Two (2) hand-held 2-way radios – provided by Commissioning Agent

B. Workstation computer to monitor and operate the equipment – Client to provide Commissioning Agent access to new workstation PC installed for security system administration workstation.
C. An 8' ladder and extension ladder for accessing interior and exterior cameras for inspection. Ladders shall be provided by GC or Installation Contractor onsite.
D. Access control card with full access rights to all doors for testing card readers – provided by Owner or Installation Contractor.

3.3 VIDEO MANAGEMENT SYSTEM

A. CCTV Cameras

Verify that the CCTV cameras listed perform the operations listed below. Total (#) locations based on issued project drawings.

1. Camera picture, data signal to NVR are acceptable.
2. Verify camera picture quality (focus, iris, correct lenses for focal range/length, etc.) for night (infrared) and day functionality.
3. Verify zoom functionality.
4. Verify programmed presets function accordingly.
5. Verify date and time are programmed and displayed correctly.
6. Verify camera titles are functioning and displaying properly for recording.
7. Verify all camera recording action responses to security events in systems.
8. Verify camera integration to access control system. Camera to provide image of associated alarm event.
9. Verify camera viewing angles/objectives are achieved relative to coverage areas indicated on design drawings (i.e. interior doors, parking area, driveway entrance etc).
10. Verify no other building objects (exit signs, landscape elements, etc) obstruct camera's field of view
11. Verify camera operating system and firmware are configured per Appendix B "POLICY ON INSTALLATION AND USE OF VIDEO CAMERAS" and Appendix F "HARVARD UNIVERSITY SECURITY SYSTEMS CYBER HARDENING GUIDELINES"
12. Verify camera video streams and software settings are configured to Harvard requirements.
13. Verify the camera firmware is installed to the latest stable or agreed upon release version.
14. Verify user access accounts are configured to Harvard requirements.
15. Items noted as "Fail" require correction by the installing contractor to provide specified functionality.

	Camera Location	**MAC & IP Addresses**	**CCTV Camera Operational Checklist Item**							**Comments**
			1	**2**	**3**	**4**	**5**	**6**	**7**	
			Function	**Picture Quality**	**Zoom**	**Date & Time**	**Camera Title**	**PTZ / Alarm Integration**	**Viewing Objective**	
1			☐ Pass ☐ Fail ☐ N/A	☐ Pass ☐ Fail ☐ N/A	☐ Pass ☐ Fail ☐ N/A	☐ Pass ☐ Fail ☐ N/A	☐ Pass ☐ Fail ☐ N/A	☐ Pass ☐ Fail ☐ N/A	☐ Pass ☐ Fail ☐ N/A	
2			☐ Pass ☐ Fail ☐ N/A	☐ Pass ☐ Fail ☐ N/A	☐ Pass ☐ Fail ☐ N/A	☐ Pass ☐ Fail ☐ N/A	☐ Pass ☐ Fail ☐ N/A	☐ Pass ☐ Fail ☐ N/A	☐ Pass ☐ Fail ☐ N/A	
3			☐ Pass ☐ Fail ☐ N/A	☐ Pass ☐ Fail ☐ N/A	☐ Pass ☐ Fail ☐ N/A	☐ Pass ☐ Fail ☐ N/A	☐ Pass ☐ Fail ☐ N/A	☐ Pass ☐ Fail ☐ N/A	☐ Pass ☐ Fail ☐ N/A	

4			☐ Pass ☐ Fail ☐ N/A	☐ Pass ☐ Fail ☐ N/A	☐ Pass ☐ Fail ☐ N/A	☐ Pass ☐ Fail ☐ N/A	☐ Pass ☐ Fail ☐ N/A	☐ Pass ☐ Fail ☐ N/A	☐ Pass ☐ Fail ☐ N/A	
5			☐ Pass ☐ Fail ☐ N/A	☐ Pass ☐ Fail ☐ N/A	☐ Pass ☐ Fail ☐ N/A	☐ Pass ☐ Fail ☐ N/A	☐ Pass ☐ Fail ☐ N/A	☐ Pass ☐ Fail ☐ N/A	☐ Pass ☐ Fail ☐ N/A	

	Checklist Completed By	**Date**

B. Network Video Recorder

Verify the network video recorder (NVR) listed is configured to agreed upon parameters with HU and performs operations as listed below:

1. Verify recording/playback functionality.
2. Verify time and date stamp.
3. Verify camera title display.
4. Verify video export features.
5. Verify video viewport display settings.
6. Verify record on motion feature is active and functioning, (if applicable).
7. Verify NVR software is installed to the latest stable or agreed upon release version
8. Verify NVR configuration and operation settings are in accordance with Harvard requirements.
    a. Verify RAID, disk, disk group, storage sets, media folders and similar configuration.
    b. Verify roles, users, and groups configurations.
    c. Verify cameras, and configured camera default stream(s), codec(s), frames per second, resolution, quality, bit rate control and profile.
    d. Verify default security settings.
    e. Verify hostname, appliance and software support IDs, time zone, time and time server configuration.
    f. Verify installed licensing.
    g. Verify final NVR configuration backup is saved, exported and provided to HU.
    h. Verify certificate(s), remote access ports and protocols, system passwords, LDAP integration and media encryption configuration.
    i. Verify network configuration, including gateway server, ports, NTP server, and bitrate caps.
    j. Verify Ethernet interfaces and WAN address(es), and defined routing UP range(s).
    k. Verify storage set and disk activity performance.
    l. Verify logs, alerting, event filtering and image detection configurations.
9. Verify user and admin accounts access are configured to Harvard requirements.
10. Verify system fail-over to redundant NVR recorder via simulated power loss to primary NVR recording unit. **HUIT shall be responsible for simulating power loss to primary NVR unit and verification that the network programming for fail-over is in place for testing of redundant NVR recording.**

Location	**MAC & IP Address**	**Specified Storage Capacity**	**Available Storage Capacity**	**NVR Operational Checklist Item**							**Comments**
				1	**2**	**3**	**4**	**5**	**6**	**7**	
				Recording/ Playback	**Time & Date**	**Camera Title**	**Video export**	**View ports**	**Record on Motion**	**System Fail-over**	
				☐ Pass ☐ Fail ☐ N/A	☐ Pass ☐ Fail ☐ N/A	☐ Pass ☐ Fail ☐ N/A	☐ Pass ☐ Fail ☐ N/A	☐ Pass ☐ Fail ☐ N/A	☐ Pass ☐ Fail ☐ N/A	☐ Pass ☐ Fail ☐ N/A	

	Checklist Completed By	Date

C. Security PC Workstation Functions

Verify functionality of the security PC workstation. Total (#) locations based on issued project drawings

1. Items noted as “Fail” require correction by the installing contractor to provide specified functionality.
2. Verify and record workstation Mac address and IP address for record.

Test Procedure	Acceptance Criteria	Pass / Fail	Comments
1. Verify the graphic user interface (GUI) displays all alarm point information.	The GUI displays all name/location information for all alarm points.	☐ Pass ☐ Fail	
2. Verify zoom function of the cameras.	The camera zoom functions are controllable from the workstation.	☐ Pass ☐ Fail	
3. Verify alarms are reported at the workstation.	Initiated alarms are reported at the workstation in the GUI display.	☐ Pass ☐ Fail	
4. Verify alarms control at the workstation.	Initiated alarms can be de-activated at the workstation in the GUI display.	☐ Pass ☐ Fail	
5. Verify historical data reports can be generated in the time specified.	Historical reports can be generated in the time specified.	☐ Pass ☐ Fail	
6. Verify graphics maps of facility floor plan displaying alarm points in GUI display.	Floor and site plan graphics maps showing all alarm points & CCTV locations.	☐ Pass ☐ Fail	
7. Verify camera view group presets are set as requested by Owner.	Camera view group presets are set according to Owner preference.	☐ Pass ☐ Fail	
8. Verify user access of software.	Access of software has been verified.	☐ Pass ☐ Fail	
9. Verify software program/schedule functionality.	Software program/schedules functionality has been verified.	☐ Pass ☐ Fail	
10. Verify NVR recording review functionality.	NVR recording review from workstation functionality has been verified.	☐ Pass ☐ Fail	
11. Verify employee photo displays at workstations when credential is used at a card reader.	Employee Photo displays in access GUI screen when card is presented to card reader. (if enabled)	☐ Pass ☐ Fail	
12. Verify client software has latest approved updates.	Verify client software has latest updates for compatibility with PC workstations.	☐ Pass ☐ Fail	
13. Verify electronic lock control from Workstation PC.	Verify doors can be locked or unlocked from Workstation PC.	☐ Pass ☐ Fail	
Checklist Completed By			**Date**

D. Intrusion Detection System Equipment

Verify that the intrusion equipment performs the operations listed below. Total (#) locations based on issued project drawings.

1. Alarm contacts operate as specified.
2. Duress button functions and reporting to security PC workstation and/or to central monitoring service (if applicable).
3. Notification to central offsite monitoring service is functioning (if applicable).
4. Verify alarm reporting and display to security PC workstation monitor.
5. Assigned zone alarm is reported to the workstation and displayed in GUI (if applicable).
6. Workstation displays correct alarm information for alarm point displayed.

7. Verify all auxiliary alarm sensors, motion detectors, acoustic glass break sensors, (list all sensors shown on Construction Documents) are functioning and reporting to the security workstation. Verify Arm/Disarm functionality.
8. Verify alarm annunciator is functioning and displaying correct alarm information (if applicable).
9. Items noted as “Fail” require correction by the installing contractor to provide specified functionality.

	Zone #	Intrusion Equipment Operational Checklist Item								Comments
		1	2	3	4	5	6	7	8	
		Functionality			Alarm Reporting					
1		☐ Pass ☐ Fail ☐ N/A	☐ Pass ☐ Fail ☐ N/A	☐ Pass ☐ Fail ☐ N/A	☐ Pass ☐ Fail ☐ N/A	☐ Pass ☐ Fail ☐ N/A	☐ Pass ☐ Fail ☐ N/A	☐ Pass ☐ Fail ☐ N/A	☐ Pass ☐ Fail ☐ N/A	
2		☐ Pass ☐ Fail ☐ N/A	☐ Pass ☐ Fail ☐ N/A	☐ Pass ☐ Fail ☐ N/A	☐ Pass ☐ Fail ☐ N/A	☐ Pass ☐ Fail ☐ N/A	☐ Pass ☐ Fail ☐ N/A	☐ Pass ☐ Fail ☐ N/A	☐ Pass ☐ Fail ☐ N/A	
3		☐ Pass ☐ Fail ☐ N/A	☐ Pass ☐ Fail ☐ N/A	☐ Pass ☐ Fail ☐ N/A	☐ Pass ☐ Fail ☐ N/A	☐ Pass ☐ Fail ☐ N/A	☐ Pass ☐ Fail ☐ N/A	☐ Pass ☐ Fail ☐ N/A	☐ Pass ☐ Fail ☐ N/A	
4		☐ Pass ☐ Fail ☐ N/A	☐ Pass ☐ Fail ☐ N/A	☐ Pass ☐ Fail ☐ N/A	☐ Pass ☐ Fail ☐ N/A	☐ Pass ☐ Fail ☐ N/A	☐ Pass ☐ Fail ☐ N/A	☐ Pass ☐ Fail ☐ N/A	☐ Pass ☐ Fail ☐ N/A	
5		☐ Pass ☐ Fail ☐ N/A	☐ Pass ☐ Fail ☐ N/A	☐ Pass ☐ Fail ☐ N/A	☐ Pass ☐ Fail ☐ N/A	☐ Pass ☐ Fail ☐ N/A	☐ Pass ☐ Fail ☐ N/A	☐ Pass ☐ Fail ☐ N/A	☐ Pass ☐ Fail ☐ N/A	
Checklist Completed By								**Date**		

E. Access Control Equipment

Verify that the access control system equipment performs the operations listed below. Total (#) locations based on issued project drawings

1. Verify card reader functions and opens the door.
2. Verify electronic lock functions.
3. Verify door request to exit operation functions.
4. Verify alarms reported at workstation for card reader/door.
5. Verify door prop alarms reported to workstation.
6. Verify Assigned zone alarm is reported to the workstation.
7. Workstation displays correct alarm information for all alarms simulated in the zone.
8. Verify door lock/unlock schedules operate as defined by Owner.
9. Verify Fire Alarm Panel integration and operation. Verify all fail-safe locks connected to the fire alarm panel unlock upon signal from fire alarm panel. **HUIT or GC will be responsible for initiation of fire alarm system for testing of lock integration**.
10. Verify that all electronic lock power supplies have battery backup or are tied into building UPS/generator power and the locks function during power loss. **HUIT or GC will be responsible to simulate power loss to lock power supplies for testing of backup power to locks.**
11. If applicable - verify system fail over to hot swap redundant access control system server via simulated power loss to primary server unit. **HUIT and HUPD will be responsible for simulating power loss to primary server unit and verification that the network programming for fail-over is in place for testing of redundant access control server.**
12. Verify that during a severed connection between host server and iStar control panel – the controller continues to function with stored database. When connection is restored – verify that the host downloads all events from the controller.

13. Items noted as “Fail” require correction by the installing contractor to provide specified functionality.

Opening #		Access Control Equipment Operational Checklist Item										
		1	2	3	4	5	6	7	8	9	10	11
		Functionality			Alarm Reporting					Fail-over / FA Integration		
1		☐ Pass ☐ Fail ☐ N/A	☐ Pass ☐ Fail ☐ N/A	☐ Pass ☐ Fail ☐ N/A	☐ Pass ☐ Fail ☐ N/A	☐ Pass ☐ Fail ☐ N/A	☐ Pass ☐ Fail ☐ N/A	☐ Pass ☐ Fail ☐ N/A	☐ Pass ☐ Fail ☐ N/A	☐ Pass ☐ Fail ☐ N/A	☐ Pass ☐ Fail ☐ N/A	☐ Pass ☐ Fail ☐ N/A
2		☐ Pass ☐ Fail ☐ N/A	☐ Pass ☐ Fail ☐ N/A	☐ Pass ☐ Fail ☐ N/A	☐ Pass ☐ Fail ☐ N/A	☐ Pass ☐ Fail ☐ N/A	☐ Pass ☐ Fail ☐ N/A	☐ Pass ☐ Fail ☐ N/A	☐ Pass ☐ Fail ☐ N/A	☐ Pass ☐ Fail ☐ N/A	☐ Pass ☐ Fail ☐ N/A	☐ Pass ☐ Fail ☐ N/A
3		☐ Pass ☐ Fail ☐ N/A	☐ Pass ☐ Fail ☐ N/A	☐ Pass ☐ Fail ☐ N/A	☐ Pass ☐ Fail ☐ N/A	☐ Pass ☐ Fail ☐ N/A	☐ Pass ☐ Fail ☐ N/A	☐ Pass ☐ Fail ☐ N/A	☐ Pass ☐ Fail ☐ N/A	☐ Pass ☐ Fail ☐ N/A	☐ Pass ☐ Fail ☐ N/A	☐ Pass ☐ Fail ☐ N/A
4		☐ Pass ☐ Fail ☐ N/A	☐ Pass ☐ Fail ☐ N/A	☐ Pass ☐ Fail ☐ N/A	☐ Pass ☐ Fail ☐ N/A	☐ Pass ☐ Fail ☐ N/A	☐ Pass ☐ Fail ☐ N/A	☐ Pass ☐ Fail ☐ N/A	☐ Pass ☐ Fail ☐ N/A	☐ Pass ☐ Fail ☐ N/A	☐ Pass ☐ Fail ☐ N/A	☐ Pass ☐ Fail ☐ N/A
5		☐ Pass ☐ Fail ☐ N/A	☐ Pass ☐ Fail ☐ N/A	☐ Pass ☐ Fail ☐ N/A	☐ Pass ☐ Fail ☐ N/A	☐ Pass ☐ Fail ☐ N/A	☐ Pass ☐ Fail ☐ N/A	☐ Pass ☐ Fail ☐ N/A	☐ Pass ☐ Fail ☐ N/A	☐ Pass ☐ Fail ☐ N/A	☐ Pass ☐ Fail ☐ N/A	☐ Pass ☐ Fail ☐ N/A
Checklist Completed By									**Date**			

F. Intercom System Interfaces

1. Verify that the intercom system devices are operational and functioning properly.
2. Verify that CCTV cameras in the vicinity of the intercom devices are able to provide image call-up at the HUPD upon intercom activation.
3. Verify and record all intercom devices Mac address and IP address for record.
4. Items noted as “Fail” require correction by the installing contractor to provide specified functionality.

Test Procedure	Acceptance Criteria	Pass / Fail	Comments
1. Verify all door intercom unit communications.	The intercom station can send and receive audio and video communication from the master intercom unit.	☐ Pass ☐ Fail ☐ N/A	
2. Verify all blue light tower Emergency phone communications	The Blue Light Tower phones can send and receive audio communication from the master intercom unit at HUPD.	☐ Pass ☐ Fail ☐ N/A	
3. Verify all elevator lobby intercom communications	The elevator lobby intercom can send and receive audio communication from the master intercom unit at the building Fire Command center. Verify calls roll over to HUPD upon no answer at Fire Command center	☐ Pass ☐ Fail ☐ N/A	
4. Verify all stair tower intercom unit communications.	The intercom station can send and receive audio communication from the master intercom unit at HUPD.	☐ Pass ☐ Fail ☐ N/A	
Checklist Completed By			**Date**

G. Optical turnstile and ACS integration Interfaces

1. Verify that the turnstiles are tied into the access control system and the turnstile is operational.
2. Verify functionality of the turnstiles and alarm reporting to designated security workstation(s).
3. Verify turnstile integration to fire alarm functions is operational.
4. Verify anti-pass back, card in/card out operation (if applicable).
5. Items noted as “Fail” require correction by the installing contractor to provide specified functionality.

Test Procedure	Acceptance Criteria	Pass / Fail	Comments
1. Verify the turnstiles open and close properly upon presentation of valid ID card at card reader.	The information for the turnstile access displays to the security PC workstation.	☐ Pass ☐ Fail ☐ N/A	
2. Verify alarms are reported at the designated security workstation of tailgating or invalid access through turnstile.	Turnstile alarms are reported at the security PC workstation.	☐ Pass ☐ Fail ☐ N/A	
3. Verify the turnstiles to fire alarm system integration function (if applicable).	Verify the turnstiles open properly for egress upon activation of fire alarm (if applicable).	☐ Pass ☐ Fail ☐ N/A	
4. Verify the card holder photo pop up in security display.	Verify the photograph of card holder displays at security workstation when presented to turnstile card reader.	☐ Pass ☐ Fail ☐ N/A	
Checklist Completed By			**Date**

General Comments:

H. Special Features Programming Verification (Owner Directed Custom Programming)

1. _____
2. _____

Test Procedure	Acceptance Criteria	Pass / Fail	Comments
1.		☐ Yes ☐ No ☐ N/A	
2.		☐ Yes ☐ No ☐ N/A	
3.		☐ Yes ☐ No ☐ N/A	
4.		☐ Yes ☐ No ☐ N/A	
Checklist Completed By			**Date**

General Comments:

A. EXCEPTION RESOLUTION FORM

1. Description of deviation/failure:

Signature Date

2. Action to be taken:

Signature Date

3. Action taken:

Signature Date

4. Approval:

Signature – Owner Date

Page ___ of ___

B. CLOSEOUT

The *Security System Commissioning Protocol* for Harvard University, Project_____Address_____ has been completed. The results have been reviewed and found to satisfy all protocol requirements. Approval is given for the acceptance of this equipment.

Commissioning Agent	Date
Owner	Date
Owner Representative	Date

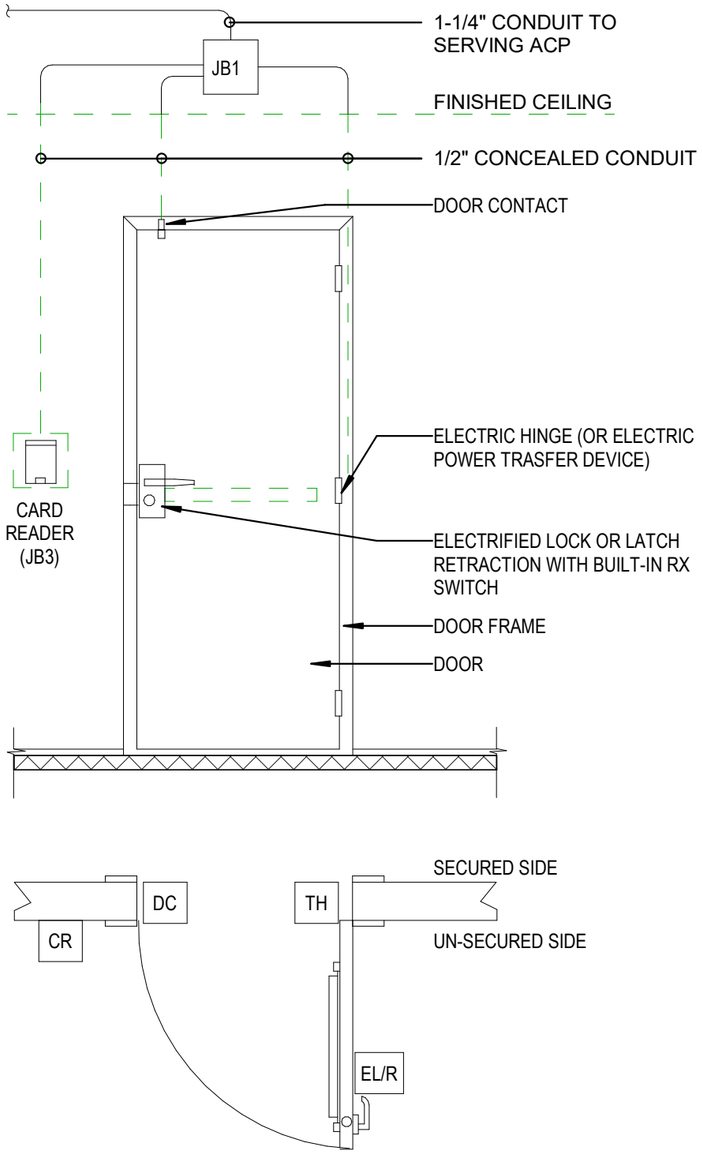
APPENDIX D
HARVARD UNIVERSITY SECURITY SYSTEMS EQUIPMENT AND PARTS LIST GUIDELINE

ITEM #	PART DESCRIPTION	MANUFACTURER	PART MODEL #	VERSION (IF APPLICABLE)	COMMENTS
1.1	Access Control Composite Cable, non-OSDP	Belden	658AFJ		Approval required
1.2	Access Control Composite Cable, OSDP	WindyCityWire	4461030-OSDP		Or Approved Equal
1.3	Card Reader Cable, non-OSDP	West Penn	253270B		Or Approved Equal
1.4	Card Reader Cable, OSDP	Windy City Wire	415110-OSDP		Or Approved Equal
1.5	Electric Lock Cable	West Penn	25224B		Or Approved Equal
1.6	Door Contact Cable	West Penn	25221B		Or Approved Equal
1.7	Request to Exit Cable	West Penn	25244B		Or Approved Equal
2.1	Access Control Door Controllers	Software House	iSTAR Ultra (GCM and ACMs)		No Substitutions
2.2	ACS Input and Output Modules	Software House	I8; R8		No Substitutions
2.3	ACS power supply and enclosure for 16 card readers	LifeSafetyPower	FPO150/250-2D8E8S		Or Altronix Equal
2.4	ACS power supply and enclosure for 8 card readers	LifeSafetyPower	FPO75/150-D8E4S		Or Altronix Equal
2.5	Card Readers	HID Global Signo	20NKS-02-00371H	Mullion, Pigtail	No Substitutions.
			20KNKS-02-00371H	Mullion, Pigtail, with Keypad	
			20TKS-02-00371H	Mullion, Terminal Strip	
			20KTKS-02-00371H	Mullion, Terminal Strip, with Keypad	
			40NKS-02-00371H	Wallswitch, Pigtail	
			40KNKS-02-00371H	Wallswitch, Pigtail, with Keypad	
			40TKS-02-00371H	Wallswitch, Terminal Strip	
			40KTKS-02-00371H	Wallswitch, Terminal Strip, with Keypad	

2.6	Request-to-exit PIR motion sensors	Bosch	DS160		Or Approved Equal
		UTS Interlogix	RCR-REX (for high security applications)		
2.7	Wireless Locks	Allegion (Schlage)	AD400, Schlage LE- for Residential projects		No Substitutions
2.8	Request-to-exit button	Highpower	Pushplate 100		Or Approved Equal
2.9	Remote Door Release Button	RCI	909S		No Substitutions
2.10	Concealed Door Position Switch	Sentrol	1078		Or Approved Equal
2.11	Surface Mount Door Position Switch	Sentrol	2505A-L		Or Approved Equal
2.12	High Security Door Position Switch	Sentrol	2700		Or Approved Equal
2.13	Tamper Switch	Bosch	ISN-CAS		Or Approved Equal
2.14	End-of-Line Resistors	GRI	6644		Or Approved Equal
2.15	Optical Turnstiles	Aeroturn	Project specific part #		Coordinate Selection with Owner and Architect
3.1	Intrusion Detection System Panel	DSC	NEO HS		No Substitutions
3.2	Intrusion System Keypad	DSC	HS2LCD		Or Approved DSC equivalent
3.3	Cellular Communicator	DSC, Telguard	3G2080		
3.4	Wall-mounted Duress Button	STI	Stopper – Custom Build		Build Specified by Owner
3.5	Under-desk mounted Duress Button	USP	HUB		Or Approved Equal
3.6	Audible Alarm	Gentex	GX93		Or Approved Equal
4.1	Video Management PlatformHU FAS	Milestone	xProtect	x.x	No Substitutions
4.2	Video Management Platform – HU HBS and HAM	Milestone	xProtect	x.x	No Substitutions
4.3	Video Management Platform – HU Credit Union	Genetec	Omnicast	x.x	No Substitutions
4.4	VMS NVR	BCDVideo	Project Specific Requirements		Project specific
4.5	Interior Fixed CCTV Camera	Axis	P3275-LV; P3285-LV		See Note 1 below.
4.6	Interior Panoramic CCTV Camera	Axis	M4328-P		See Note 1 below.
4.7	Exterior Fixed CCTV Camera	Axis, Hanwha	P3285-LVE		N See Note 1

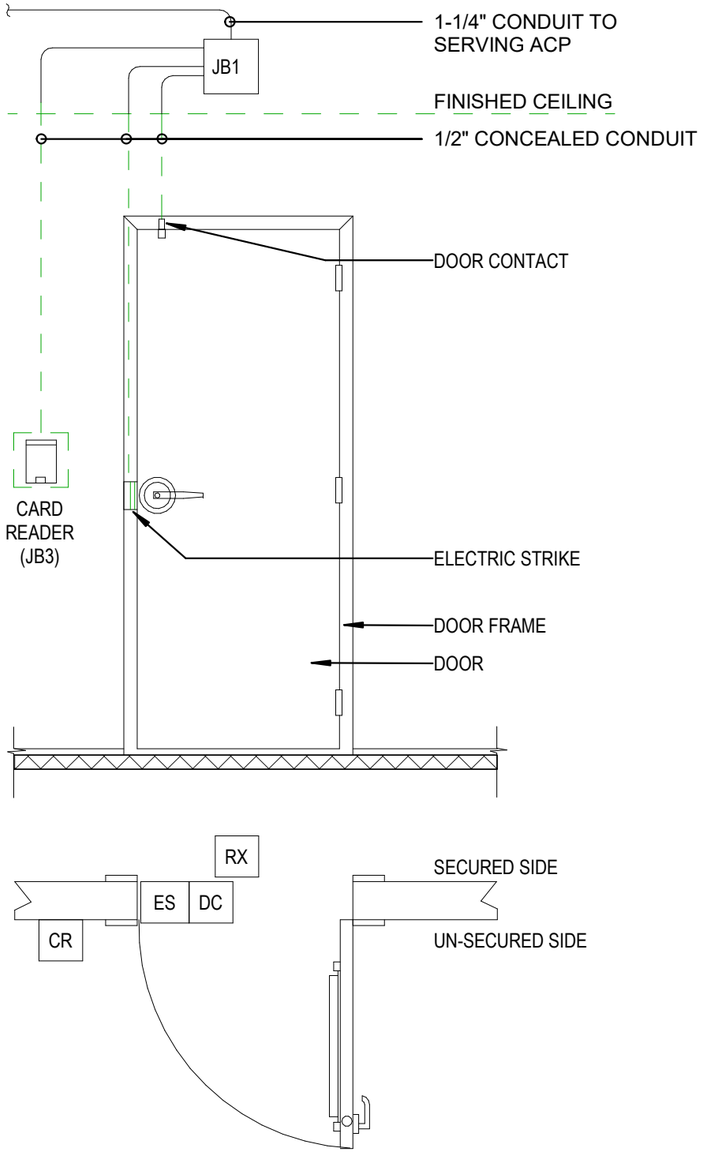
					below.
4.8	Exterior Panoramic CCTV Cameras	Axis, Hanwha	P4705-PLVE; P3738-PLE; AXIS Q3839-PVE		See Note 1 below.
4.9	Exterior Camera Surge Protector	Ditek	DTK-MRJPOES		Or Approved Equal
5.1	Blue Light Emergency Communication Tower	Talk-A-Phone	ETP-series		No Substitutions
5.2	Blue Light Tower Analog Communication Device	Talk-A-Phone	ETP-500		No Substitutions
5.3	Building Intercom Master Station	Aiphone	IX-MV7		Or Approved Equal
5.4	Building Intercom Voice-only door station	Aiphone	IX-SS-2G		Or Approved Equal
5.5	Building Intercom Video door station	Aiphone	IX-DV		Or Approved Equal
5.6	Building Intercom Relay	Aiphone	IXGW-LC-RY20		Or Approved Equal

APPENDIX E
HARVARD UNIVERSITY SECURITY SYSTEMS TYPICAL INSTALLATION DETAILS



1 / 1 **SINGLE DOOR DETAIL WITH EL/ELR**

12" = 1'-0"



2 / 1 **SINGLE DOOR DETAIL WITH ES**

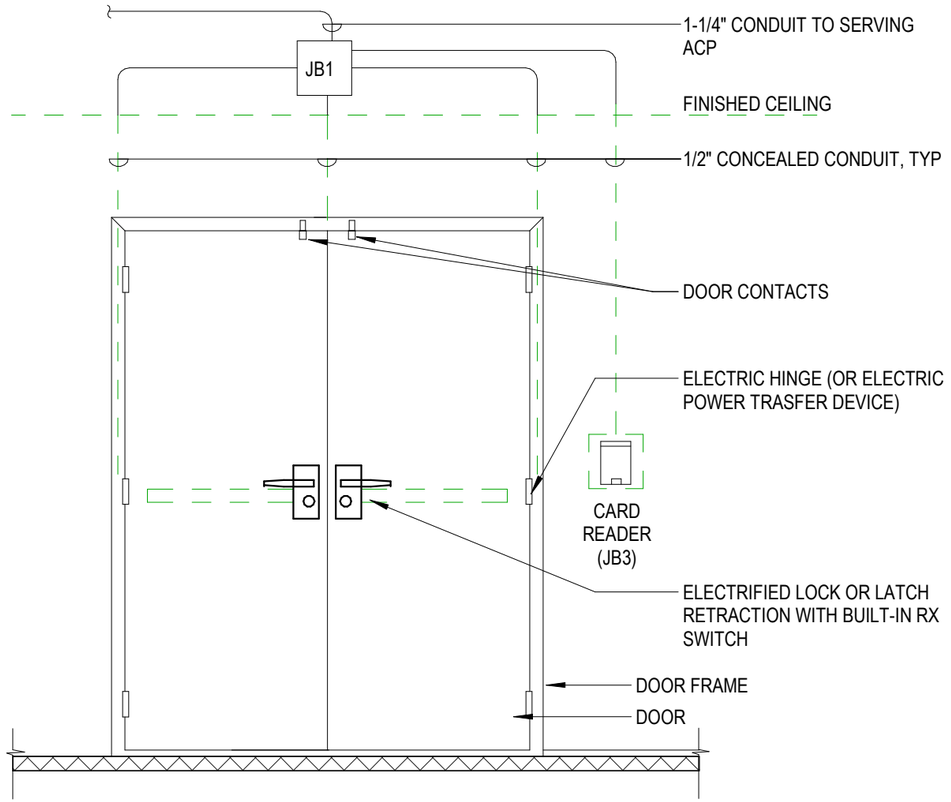
NTS

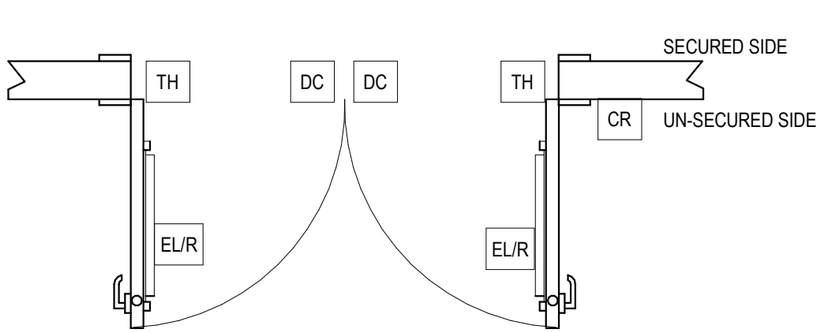
LEGEND

CR	CARD READER
RX	PIR/MW REQUEST-TO-EXIT MOTION SENSOR
DC	DOOR CONTACT
EL/R	ELECTRIFIED LOCK OR LATCH RETRACTION
ES	ELECTRIC STRIKE
ML	ELECTROMAGNETIC LOCK
PP	ADO PUSH PLATE
PB	DOOR RELEASE PUSH BUTTON
TH	ELECTRIC TRANSFER HINGE
ADO	AUTOMATIC DOOR OPERATOR
JB0	MANUFACTURER-SPECIFIC DEVICE BOX
JB1	6" x 4" SQUARE JUNCTION BOX
JB2	4-11/16" x 3" SQUARE JUNCTION BOX
JB3	4-11/16" x 2-1/8" SQUARE DEVICE BOX

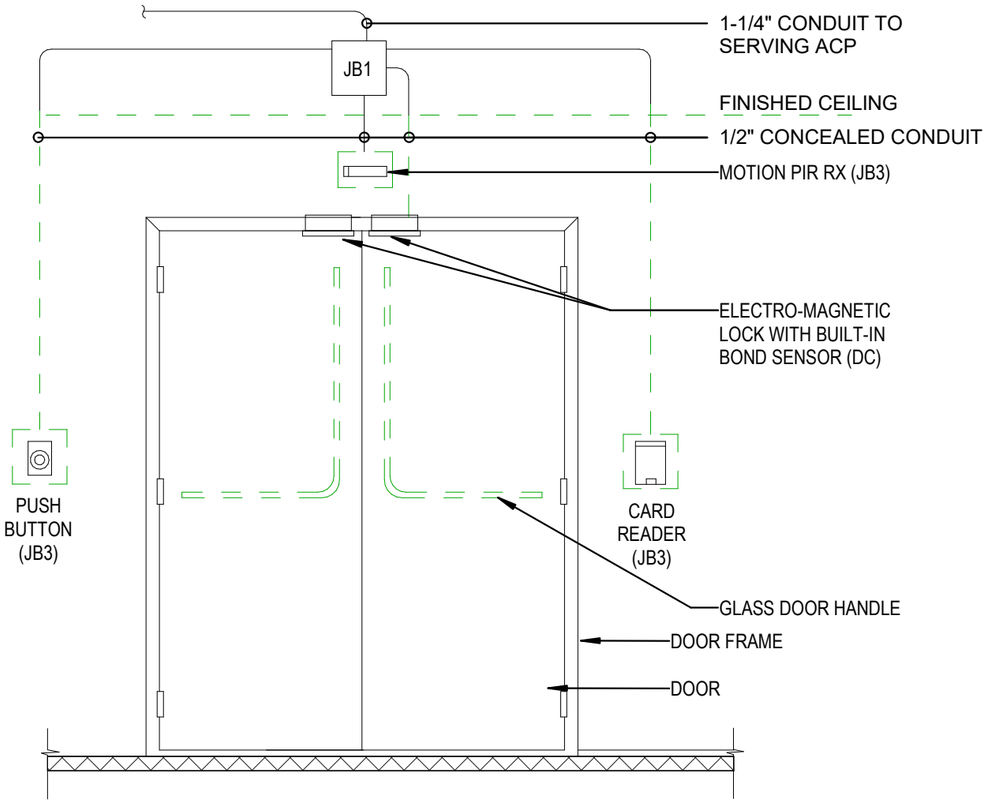
APPENDIX D
TYPICAL HUIT DOOR DETAILS

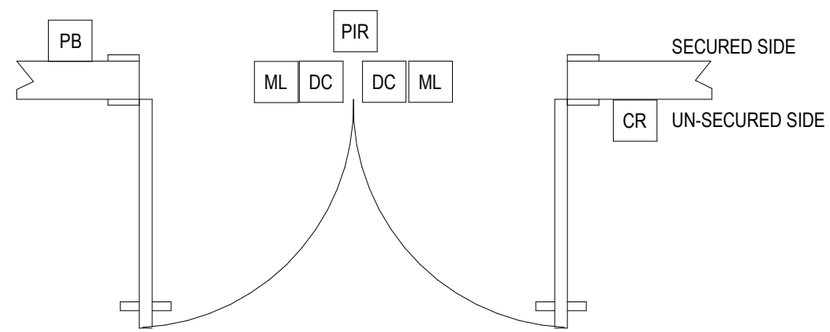
DATE: 04.01.2021
REVISION: 1.0





1/2 **DOUBLE DOOR DETAILWITH EL/ELR**
NTS





2/2 **DOUBLE DOOR DETAIL WITH ML**
NTS

LEGEND	
CR	CARD READER
RX	PIR/MW REQUEST-TO-EXIT MOTION SENSOR
DC	DOOR CONTACT
EL/R	ELECTRIFIED LOCK OR LATCH RETRACTION
ES	ELECTRIC STRIKE
ML	ELECTROMAGNETIC LOCK
PP	ADO PUSH PLATE
PB	DOOR RELEASE PUSH BUTTON
TH	ELECTRIC TRANSFER HINGE
ADO	AUTOMATIC DOOR OPERATOR
JB0	MANUFACTURER-SPECIFIC DEVICE BOX
JB1	6" x 4" SQUARE JUNCTION BOX
JB2	4-11/16" x 3" SQUARE JUNCTION BOX
JB3	4-11/16" x 2-1/8" SQUARE DEVICE BOX

APPENDIX D
TYPICAL HUIT DOOR DETAILS

DATE: 04.01.2021
REVISION: 1.0

APPENDIX F
HARVARD UNIVERSITY SECURITY SYSTEMS CYBER HARDENING GUIDELINES

Every new device connected to IP network comes with potential security vulnerabilities. It shall be the responsibility of the Security contractor to secure all Access Control, Video, Intercom, and Intrusion system devices as specified on manufacturer's hardening guides. Below is a list of minimum required areas of network hardening to be addressed by the Security contractor:

1. Change the default Admin password to a long, unique, random string. Do not use common names, dates, common passwords, repeated sequences, and keyboard patterns.
2. Enforce a strong user password policy, including minimum length, complexity and expiration periods.
3. If available, activate auto locking of the security workstation, server and other OT devices after the period of inactivity.
4. Use HarvardKey integration with two-factor Authentication (2FA) for logon.
5. Restrict server and workstation Admin access to local connections only.
6. Restrict user privileges to minimum required privileges.
7. Keep applications and programs updated to latest (recommended) version available.
8. Keep device's firmware updated to latest (recommended) version.
9. Utilize secure communication between devices and servers.
10. Deactivate unused services and ports on each system (telnet, UPnP, Bonjour, and others).
11. Use system logging for all functions to allow for record of activity trails.
12. Use valid certificates on all server connections. Replace self-signed certificates with ones from trusted certificate authority.
13. Use only HTTPS for communication between mobile and webserver connections.
14. Disable Audio on cameras that have it ON by default.
15. Encrypt Edge storage devices on all cameras.
16. Use NTP to synchronize all clocks in the system.

All the above steps, plus any additional steps, shall be coordinated with HUPD, HUIT and other HUIT groups prior to implementation.