(NOTE TO DESIGNER: These Specifications are basic minimum criteria to be met in preparing the final specifications for this section, which is the responsibility of the Designer.)

SECTION 28 05 00
COMMON WORK RESULTS FOR ELECTRONIC SAFETY AND SECURITY

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Summary
B. Related Documents
C. Reference Standards And Codes
D. Administrative Requirements
E. Work Results - Description Of Project
F. Commissioning Administration
G. Proposal Submittals
H. Submittals For Project Record
I. Equipment Relocation And System Startup
J. Sequencing And Scheduling
K. Quality Assurance - Contractor Qualifications
L. Product Schedule
M. Warranty
N. Manufactured products
O. Equipment Requirements
P. Labeling
Q. Equipment Protection
R. Site Conditions
S. Examination
T. Preparation
U. Product Quality Assurance
V. Demolition / Removal
W. Firestopping
X. Construction Waste Management
Y. Closeout Activities
Z. Singular Number
AA. Training

1.2 SUMMARY

A. This document identifies the design and specification requirements for a complete and functional Electronic Safety and Security system to be performed for the University of Houston [Project Name]. [Insert Project description.]. The Electronic Safety and Security as specified herein will support the access control, intrusion, video surveillance, electronic personal protection systems connectivity, and various other low voltage devices.

B. This Section, Requirements for Electronic Safety and Security Installations, applies to all sections of Division 28.

C. The Architectural Plans and Specifications, General Conditions, Supplementary General Conditions and other requirements of Division 1, the Mechanical Plans and Specifications, the Electrical Plans and Specifications, and the Security Plans may apply to the work specified in the Division 28 Sections, and shall be complied with in every respect. The Contractor shall examine all of these documents, which make up the Contract Documents, and shall coordinate them with all security work on the Security plans and in the Division 28 specifications.

D. Contract Documents: Drawings and specifications are to be used in conjunction with one another and to supplement one another. In general the specifications determine the nature and quality of the materials, and the drawings establish the quantities, details, and give characteristics of performance that should be adhered to in the installation of the security system components. If there is an apparent conflict between the drawings and specifications, the items with the greater quantity or quality shall be estimated upon and installed. Clarification with the Owner or their designated representative about these items shall be made prior to bid response.

E. The Architect may at any time, by written order, make changes within the general scope of any contract resulting from this proposal document. If such changes expand, reduce, change or modify the scope of work, the price for the change shall be increased or decreased at the unit prices set forth in the Unit Pricing Section, and the amount shall be deducted from, or added to, the sale price of the system to the Owner. No costs will be added to the project without prior written approval from the Architect.

1.3 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

B. Related Division 28 Sections include:
1. 28 05 00 Common Work Results for Electronic Safety and Security
2. 28 05 26 Grounding and Bonding for Electronic Safety and Security
3. 28 05 28 Pathways for Electronic Safety and Security
4. 28 05 53 Identification for Electronic Safety and Security
5. 28 06 00 Testing for Electronic Safety and Security
6. 28 13 00 Access Control
7. 28 16 00 Intrusion Detection
8. 28 23 00 Video Surveillance
9. 28 26 00 Electronic Personal Protection System

C. Adherence to, and compliance with, the codes and standards referenced, and the University of Houston Campus Design Guidelines is mandatory. Requests to deviate from the University standards and design solutions prescribed in these guidelines may be submitted, on a case-by-case basis, in accordance with the instructions in the Policy and Procedures section of these guidelines. No deviation from the requirements of the National Electrical Code (NEC) will be allowed.

1.4 REFERENCES

A. Related Division 28 Sections include: (*Latest issue and addenda)
1. National Electric Code (NEC), Latest Issue

2. ADA Standards for Accessible Design 28 CFR Part 36
2. U.S. Department of Labor Occupational Safety & Health Administration (OSHA)
3. UH Information Technology Telecommunications Infrastructure Standards
4. BICSI Electronic Safety & Security Design Reference Manual
5. ANSI/TIA/EIA568-B.1 - Commercial Building Telecommunications Cabling Standard*
6. ANSI/TIA/EIA568-B.2 - Commercial Building Telecommunications Cabling Standard*
7. ANSI/TIA/EIA568-B.3 - Optical Fiber Cabling Components Standard*
8. ANSI/TIA/EIA569 - Commercial Building Standard for Telecommunications Pathways and Spaces*
9. ANSI/TIA/EIA606-A - Administration Standard for Commercial Telecommunications Infrastructures, June 21, 2002*
10. ANSI J-STD-607-A, Commercial Building. Grounding/Bounding Requirements- Joint Standard for Commercial Building Grounding (Earthing) and Bonding Requirements for Telecommunications, 2002*
11. ANSI/TIA/EIA758-A - Customer-owned Outside Plant Telecommunications Infrastructure Standard, May 2005*
12. International Standards Organization/International Electro technical Commission (ISO/IEC) IS 11801, 2000*
13. Underwriters Laboratories (UL) Cable Certification and Follow up Program*
14. National Electrical Manufacturers Association (NEMA)*
15. American Society for Testing Materials (ASTM)*
16. Chapter 208- State of Texas Communications Wiring Standard
17. UH MAPP - UH Manual of Administrative Policies and Procedures
18. BICSI Electronic Safety & Security Design Reference Manual

B. Acronyms and Abbreviations

1. ADA Americans with Disabilities Act
2. AKA Also known as
3. AMS Access management systems
4. ANSI American National Standards Institute
5. AP Access provider
6. ASTM American Society for Testing and Materials
7. AWG American Wire Gauge
8. BICSI Building Industry Consulting Services International
9. CATV Community antenna television
10. CCTV Closed circuit television
11. CO-OSP Customer owned outside plant
12. DVR Digital video recorder
13. EF Entrance facility
14. EIA Electronic Industries Alliance
15. EMI Electromagnetic interference
16. FCC Federal Communications Commission
17. FPS Frames per second
18. HVAC heating, ventilation, and air conditioning
19. IEEE The Institute of Electrical and Electronics Engineers
20. ITNO Information Technology Network Operations
21. ISO International Organization for Standardization
22. LAN Local area network
23. Mb/s Megabits per second
24. MC Main cross-connect AKA Main Distribution Frame (MDF)
25. MDF Main distribution frame AKA main cross-connect (MC)
26. NEMA National Electrical Manufacturers Association
27. NESCÒ National Electrical Safety Code
28. NFPA National Fire Protection Association

29. NVR Network video recorder
30. OFOI Owner Furnished Owner Installed
31. RCDD Registered Communications Distribution Designer
32. SCS Structured Cabling System
33. SMS Security management systems
34. TBB Telecommunications bonding backbone
35. TR Telecommunications room AKA Intermediate Distribution Frame (IDF)
36. TGB Telecommunications grounding busbar
37. TMGB Telecommunications main grounding busbar
38. TIA Telecommunications Industry Association
39. UHPS University of Houston Public Safety Department
40. UL Underwriters Laboratories
41. UPS Uninterruptable power supply
42. UTP Unshielded twisted-pair
43. WA Work area
44. WAP Wireless access points
45. X cross-connect

1.5 ADMINISTRATIVE REQUIREMENTS

A. Coordination
   1. The Security Contractor, here after referred to as “Contractor”, shall provide all materials, components, tools and labor necessary for the complete installation of all Electronic Safety and Security work required in the contract documents and specified herein.
   2. The Communications Cabling Contractor, here after referred to as “Communications Contractor”, shall provide all materials, components, tools and labor necessary for the complete installation of all communications work required in the contract documents and specified herein.
   3. The Electrical Contractor, here after referred to as “Electrical Contractor”, shall provide materials, components, tools and labor to complete the electrical power distribution.
   4. Work furnished and installed by the Contractor as specified in Division 28 and as shown in SC and T drawings includes:
      a. Identification for Electronic Safety and Security Systems;
      b. Electronic Safety and Security Systems Cabling;
      c. Patch Cords, Station Cords, and Cross-Connect Wire;
      d. Coordination with Communications Contractor;
      e. Coordination with OFOI Communications Services;
      f. Coordination with Wayfinding Guidelines.
   5. Work under this Division not in contract (NIC) that will be Owner Furnished/Owner Installed (OFOI) includes:
      a. [include OFOI items]
   6. Work furnished and installed by the Electrical Contractor as specified in Division 28 and as shown in E and SC drawings includes:
      a. The conduits and back boxes for the Electronic Safety and Security device outlets.
      b. Electrical circuits for the Security rooms.
   6. Work furnished and installed by others.
      a. The new ER walls shall be covered with rigidly fixed ¾” marine plywood, void free, 8 ft high, and capable of supporting attached equipment and hardware. Plywood should be covered with two coats of fire retardant paint.

1.6 WORK RESULTS - DESCRIPTION OF PROJECT

A. Administrative Services
   1. Contractor is required to provide test results and as-built documentation/record drawings prior to job acceptance. Refer to Section 28 06 00.

B. Grounding and Bonding for Electronic Safety and Security
   1. Bonding conductors from the TMGB or TGB will be installed to all security equipment cabinets, equipment racks, raceway, cable ladder rack, cable tray, sleeves and conduits. Bond all TGBs to the TMGB per Section 280526.
   2. Bond TMGB to building ground per Section 280526.
   3. Final design and specifications for the Grounding and Bonding system shall be coordinated with the Electrical Engineer of Record.

C. Pathways for Electronic Safety and Security
   1. VoIP Powered Devices
      a. The primary horizontal cable support system shall be conduit to cable tray and or J hooks, installed parallel to column lines. Wall penetrations shall transition to properly firestopped sleeves, then back to cable tray and or J hooks.
      b. Outlets having one single cable require a single gang box that routes to the cable tray via min.1" conduit with pull string. Unless noted otherwise on drawings.
      c. Conduit runs may not be longer than 100ft or contain more than two 90 degree bends between pulling points, pull boxes or reverse bends without the use of a properly sized junction box. Insulated throat compression fittings must be used for security conduit runs, with termination points having plastic or grounding bushings installed.
      d. Riser sleeves in ER/TR must be properly installed with bushings and firestop. Provide Shop Drawings of all core drilling locations for coordination with Architect and Owner prior to drilling.
      e. All security conduits shall be provided with a measured pull tape.
   2. Access Control Devices
      a. The primary horizontal cable support system for Access Control devices shall be conduit or dedicated cable tray or J hook pathway. Wall penetrations shall transition to properly firestopped sleeves, then back to cable tray and, or, J hooks.

D. Identification for Electronic Safety and Security
   1. All cable labeling will be compliant with TIA/EIA606-A - Administration Standard for Commercial Telecommunications Infrastructures as described in Section 28 05 53.
   2. All labeling will comply with Owner administrative labeling scheme of cabling and its numerical positions on the termination hardware. Ensure compliance with Owner's preferred administrative labeling standards.

E. Electronic Safety and Security Equipment Room Fittings
   1. Contractor shall provide each ER/TR with proper equipment installed per Division 28 specifications and drawings.

G. Electronic Safety and Security Horizontal Cabling
   1. Installed by Communications Contractor:
      a. Security camera cables will consist of plenum rated, Category 6, 4 pair UTP copper cables terminated on 48 port, RJ45, Category 6, 568B patch panels in the ER/TRs. The maximum horizontal distance shall be 295 feet.
      b. Access control cables will consist of plenum rated, 4C 22AWG 2pr. (Installed by Communications contractor, unless noted on drawings)
      c. Unless noted, provide proper plenum rated cabling for all Electronic Safety and Security equipment and devices- locations as detailed on the Security drawings.
   2. Installed by Electrical Contractor:
      a. Security camera power cables will consist of plenum rated, 18AWG-2C, Low voltage cabling installed by Contractor). Unless noted on drawings, 16AWG-2C. High voltage cabling installed by Electrical Contractor.

H. Termination Hardware
   1. All Electronic Safety and Security cabling shall terminate in proper enclosures, back boxes,

electronic devices per drawing, specifications, and manufacturer standards.

I. Patch Cords, Station Cords, and X-Connect Wire
   1. Contractor shall provide two (2) Category 6 patch cords per Security camera cable installed: 50% 5' length, 50% 3' length. (Provided by communications contractor)

J. Data Communications Equipment
   1. Data communications equipment will be OFOI.

K. Network Connectivity for Other Trades: Communications Contractor will provide the following only for Division 28, unless noted on drawings.
   1. Electronic Safety and Security –Copper and fiber cabling and termination hardware as required facilitating voice and data network connectivity for IP cameras, Emergency Call Towers, Access Control Panels. Refer to Security drawings and specifications for details.
   2. Fire Alarm –Copper or fiber connectivity as required for Fire Alarm Panels.
   3. Elevator Equipment Room – Copper connectivity to elevator equipment room(s). Coordinate with elevator equipment provider.

L. Commissioning Administration
   1. Contractor shall comply with General Commissioning Requirements of the Security infrastructure system.

M. Project Meetings
   1. Contractor shall attend preconstruction meetings with Project Team.
   2. Contractor shall provide representation on Project Team Meeting as specified in Division 1 and by the General Contractor as required.
   3. Contractor will provide representation on the Commissioning Team as required for implementation of the Commissioning Plan.

O. Preconstruction Evaluation
   1. Examination of buildings and site shall be the responsibility of the Contractor. Examine conditions for compliance with Electronic Safety and Security design specifications. Validate Security section is in accordance with related Contract Documents and the specified Owner's operational needs.

P. Construction Documentation
   1. Contractor shall coordinate requirements with General Provisions specified in Division 1 - Construction Progress Documentation.
   2. Contractor shall provide weekly progress report including synopsis of previous week's completed tasks, list of ongoing work, and updated schedule addressing milestones. Also include items for Owner coordination.
   3. Contractor shall provide weekly report of inspection by project manufacturer certified installation firm to confirm Contractor's work is compliant with industry and manufacturer standards.

1.7 PROPOSAL SUBMITTALS

A. Follow Division 1 and this section.

B. A list of technical product education (training) completed by the Contractor's project personnel.
   1. 100 percent of the on-site installation team members shall possess certification by Pelco Manufacturer as having completed the necessary training for installation, programming, and troubleshooting.
   2. At a minimum, one (1) on-site personnel shall have appropriate Strand Video System training for installation, programming, and troubleshooting.
   3. 100 percent of on-site installation personnel shall have BISCI certification in effect through the bidding process, installation, testing, documentation and acceptance. Documentation of all on-site personnel shall be provided post recommendation of selected contractor before final ITNO approval will be given.

4. Certificates shall be included in all responses to RFP/RFO documents.
5. Documentation of all on-site personnel shall be provided post recommendation before final ITNO approval will be given.

C. Price Quotation Information -
1. Submit Itemized Unit Pricing for Labor and Material.

D. The Contractor shall review this Section; Codes and Standards - Latest issue and addendums and state understanding and compliance or exception.

E. Project schedule including all work components.

F. Product Data: For each type of product indicated below. Product data to include, but not limited to materials, finishes, approvals, load ratings, and dimensional information.
1. Submittals shall include the manufacturers cut sheets for the following:
a. Equipment enclosures and/or racks;
b. Electronic equipment/Devices;
c. Cables;
d. Connectors and termination hardware;
e. Protection hardware;
f. Fire stopping materials;
g. Test equipment to be used;
h. Cable support hardware.

G. Product Data Manufacturer’s literature sheets for all materials and equipment, including a copy of the proposed warranty, recommended preventative maintenance and spare part inventory recommendations. Literature containing more than one device shall be clearly marked to delineate item(s) included in the work. Clearly indicate color or special finishes.

H. Manufacturer and Contractor statement of RoHS: Restriction of Certain Hazardous Substances Compliance.

I. Design and Installation Certificates: Signed by local cable manufacturer's representative certifying that design is acceptable with cable manufacturer's Design Engineer(s) and Contractor is authorized by manufacturer to install registered (warranty) cabling system.

J. A minimum of five (5) representative educational facilities security projects must be submitted as references to include the school's name, location, Architect or Engineer, cost of the security project and the contact person at the school district to include phone number.

K. Submit written proof that the contractor is certified by the manufacturer of the products and adheres to the engineering, installation and testing procedures and utilizes the authorized manufacturer components and distribution channels in provisioning this Project.

1.8 SUBMITTALS

A. Submit in accordance with Section xx xx xx, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.

B. The Owner's approval shall be obtained for all equipment and material before delivery to the job site. Delivery, storage or installation of equipment or material which has not had prior approval will not be permitted at the job site.

C. All submittals shall include adequate descriptive literature, catalog cuts, shop drawings and other data necessary for the Owner to ascertain that the proposed equipment and materials comply with specification requirements. Catalog cuts submitted for approval shall be legible and clearly identify equipment being submitted.

D. Submittals for individual systems and equipment assemblies which consist of more than one item or component shall be made for the system or assembly as a whole. Partial submittals will not be

considered for approval.

1. Mark the submittals, "SUBMITTED UNDER SECTION_____".
2. Submittals shall be marked to show specification reference including the section and paragraph numbers.
3. Submit each section separately.

E. The submittals shall include the following:
   1. Information that confirms compliance with contract requirements. Include the manufacturer's name, model or catalog numbers, catalog information, technical data sheets, shop drawings, pictures, nameplate data and test reports as required.
   2. Elementary and interconnection wiring diagrams for communication and signal systems, control system and equipment assemblies. All terminal points and wiring shall be identified on wiring diagrams.
   3. Parts list which shall include those replacement parts recommended by the equipment manufacturer, quantity of parts, current price and availability of each part.

F. Manuals: Submit in accordance with Section 01 00 00, GENERAL REQUIREMENTS.
   1. Maintenance and Operation Manuals: Submit as required for systems and equipment specified in the technical sections. Furnish four copies, bound in hardback binders, (manufacturer's standard binders) or an approved equivalent. Furnish one complete manual as specified in the technical section but in no case later than prior to performance of systems or equipment test, and furnish the remaining manuals prior to contract completion.
   2. Inscribe the following identification on the cover: the words "MAINTENANCE AND OPERATION MANUAL," the name and location of the system, equipment, building, name of Contractor, and contract number. Include in the manual the names, addresses, and telephone numbers of each subcontractor installing the system or equipment and the local representatives for the system or equipment.
   3. Provide a "Table of Contents" and assemble the manual to conform to the table of contents, with tab sheets placed before instructions covering the subject. The instructions shall be legible and easily read, with large sheets of drawings folded in.
   4. The manuals shall include:
      a. Internal and interconnecting wiring and control diagrams with data to explain detailed operation and control of the equipment.
      b. A control sequence describing start-up, operation, and shutdown.
      c. Description of the function of each principal item of equipment.
      d. Installation and maintenance instructions.
      e. Safety precautions.
      f. Diagrams and illustrations.
      g. Testing methods.
      h. Performance data.
      i. Pictorial "exploded" parts list with part numbers. Emphasis shall be placed on the use of special tools and instruments. The list shall indicate sources of supply, recommended spare parts, and name of servicing organization.
      j. Appendix; list qualified permanent servicing organizations for support of the equipment, including addresses and certified qualifications.

G. Approvals will be based on complete submission of manuals together with shop drawings.

H. After approval and prior to installation, furnish the Resident Engineer with one sample of each of the following:
   1. A 12 inch length of each type and size of wire and cable along with the tag from the coils of reels from which the samples were taken.
   2. Each type of conduit and pathway coupling, bushing and termination fitting.
   3. Conduit hangers, clamps and supports.

4. Duct sealing compound.

1.9 SUBMITTALS FOR PROJECT RECORD

A. Follow Division 1 and this Section.
1. Drawings: As-built documentation must be submitted five (5) business days prior to obtaining approval for cutover to any portion of the security system. Furnish for review and comments, 4 complete sets of E size (30 by 42) and 4 complete sets of C size as-built drawings along with 4 CDs containing all electronic AutoCAD 2000 or newer (DWG) files.
2. Final approved Shop Drawings: Include plan and elevation of TRs, cable pathway details Backbone and horizontal, and cable locations and cable ID#, block diagrams, Interface requirements including connector types and pin-outs for all security equipment, Fabrication drawings for custom built equipment.
3. Final approved Shop Drawings: One set shall be laminated and placed in appropriate ER/TR/ER.
4. 4 sets of equipment /device inventory data must be submitted for all cable, termination hardware Submit data in binders and electronically on CDs in "Microsoft Excel" format, listing products furnished, including:
   a. Manufacturer's name and part numbers.
   b. Cable numbers utilizing the Owner's cable numbering standard.
   c. Location and UH label / tagging assignments.
5. Manufacturer Certificates: Within 10 days of completion of the project, Contractor shall deliver letter signed by local Structured Cabling Components representatives and Contractor's RCDD stating that installed cabling system complies with all requirements specified in manufacturer's installation guidelines and that there were no accidents, improper installation, mishandling, misuse, damage while in transit, unauthorized alteration, unauthorized repair, failure to follow instructions, or misuse with the structured cabling system that could adversely impact warranty.
6. Test Reports: 4 sets of hard copies with 4 copies on CD in compliance with related Test Result Documentation.
7. Submitted test results and other submittals that are non-compliant will be reviewed and returned to the Contractor with comments.
8. Re-submitted test results and other submittals that are non-compliant will be reviewed and returned to the Contractor with comments.
9. Subsequent reviews of test results and other submittals will be performed jointly by the Contractor and the Communications Consultant and Contractor will pay Communications Consultant's published hourly rate during third review and thereafter.
10. Manufacturer's warranty to the Owner. This shall include, but is not limited to: Owner's name and project name and address. (Within three weeks of substantial completion).
11. Within 10 days of completion of the project, Contractor shall deliver letter signed by local SCS Manufacturers representative and Contractor's RCDD stating that installed cabling system complies with all requirements specified in installation guidelines and that there were no accidents, improper installation, mishandling, misuse, damage while in transit, unauthorized alteration, unauthorized repair, failure to follow instructions, or misuse with the structured cabling system that could adversely impact warranty.
12. Within 21 days of completion of the project, the communications contractor and/or the manufacturer's local representative will provide Owner the Performance Warranty signed by the manufacturer. The warranty shall list the owner and name of the facility, including location, as the holder of the warranty.

1.9 EQUIPMENT RELOCATION AND SYSTEM STARTUP

A. Upon notice of construction completion, the selected Contractor will be responsible for system startup services for the new telecommunication room. The Contractor shall be responsible for ensuring the new equipment rooms, cabinets, floors and walls are clean and ready for equipment installation. On behalf of the Owner, the Contractor shall be responsible for coordinating with the GC and other trades to keep

the ER and TRs clean and dust free at all times.

B. It shall be the responsibility of the Contractor to develop and implement a full migration project schedule detailing the responsibilities of assigned personnel, along with contingency plans, and submit it to the Owner, or their designated representative, for approval.

C. During the transition period, Contractor shall have the necessary supervisory, technical, and other personnel available throughout relocations and cutover of the Electronic Safety and Security systems. This is to ensure that technicians are on site to observe the operation and maintenance of the equipment, and to resolve any related issues during system start-up.

D. Contractor shall ensure all amenities are present prior to equipment relocation. Contractor shall immediately contact the Owner, or their designated representative, if a required service such as HVAC, electrical, UPS, etc., are not present.

E. Contractor shall accomplish a smooth and successful transition of operations and services to the new telecommunication room. The transition includes the coordination, migration, testing, and problem resolution with the system vendors.

1.10 SEQUENCING AND SCHEDULING

A. An initial planning meeting will be held with the successful bidder to clarify all requirements (systems, services, distribution methods, etc.), identify responsibilities, and schedule the events that will transpire during the implementation of the project. Within two (2) weeks of the initial meeting, the Contractor shall provide a written report and project schedule to clearly document the events and responsibilities associated with the project.

B. Contractor shall be responsible for the development and implementation of a complete project schedule detailing the responsibilities of assigned personnel and submit it to the GC and Owner for approval.

1.11 QUALITY ASSURANCE - CONTRACTOR QUALIFICATIONS

A. Follow Division 1 and this Section.

B. Video Surveillance
   1. The contractor must be a member of Building Industry Consulting Service International (BICSI).
   2. The Contractor shall have a minimum of one (1) full time employee on staff that is a BICSI Registered Communications Distribution Design (RCDD) with Pelco certification on staff. The RCDD shall review and approve the design and construction plans and inspect work and report status on a weekly basis of Electronic Safety and Security system.
   3. Supervisor or Lead Technician shall possess BICSI certificates of completion for training course TE300.
   4. Installation Technicians should possess BICSI certificates of completion for the training course IN100 for ITS Installer Level 1 and preferably IN200 for ITS Installer Level 2.
   5. 100 percent of the on-site installation personal must be Pelco trained and Certified.
   6. A copy of the Pelco certificates or verification by Pelco records must accompany contractor bid, no expired certificates and certificates issued under Pelco past certification programs will be accepted.
   7. Testing Technicians should possess manufacturer's certificates of completion for the test equipment used on the project.
   8. The contractor shall not subcontract installation of Electronic Safety and Security system cabling, termination or testing without the written consent of University of Houston review, and confirmation to University of Houston of proposed subcontractor’s current and valid certified status.
   9. The contractor shall have worked satisfactorily for a minimum of five (5) years on systems of this type and size.

10. Upon request by UH, furnish a list of references with specific information regarding type of project and involvement in providing of equipment and systems.
11. Material shall be new, and conform to grade, quality, and standards specified. Materials of the same type shall be a product of the same manufacturer throughout.
12. Subcontractors shall assume all rights and obligations toward the contractor that the contractor assumes toward the University of Houston.
13. Quality Assurance inspections will be coordinated with ITCS, UHPS Project Managers.
14. The Contractor shall possess the most recent version of the TIA/EIA 568 B Series Telecommunications Building Wiring Standards available from Global Engineering Documents.
15. The Contractor shall possess at least one copy of BICSI Telecommunications Distribution Methods Manual, Eleventh Edition, or newer.
16. Testing Technicians should possess manufacturer's certificates of completion for the test equipment used on the project.
17. Untrained, undocumented, or otherwise unqualified personnel are not allowed to perform any portion of the Electronic Safety and Security installation.
18. All personnel must be permanent employees of the contractor, or approved sub-contractors.

PART 2 - PRODUCTS

2.1 PRODUCT SCHEDULE

A. Refer to Division 28 sections for approved product and schedules.
1. 28 05 00 Common Work Results for Electronic Safety and Security
2. 28 05 26 Grounding and Bonding for Electronic Safety and Security
3. 28 05 28 Pathways for Electronic Safety and Security
4. 28 05 53 Identification for Electronic Safety and Security
5. 28 06 00 Testing for Electronic Safety and Security
6. 28 13 00 Access Control
7. 28 16 00 Intrusion Detection
8. 28 23 00 Video Surveillance
9. 28 26 00 Electronic Personal Protection System

2.2 WARRANTY

A. Network cabling warranty will be provided per Division 27.

B. Provide a minimum (1) year warranty on all parts and labor.

C. Provide an extended service agreement (3) year, with (5) year option, for parts and labor warranty at time of proposal.

D. The Labor, Material and Performance Warranty shall cover the testing and replacement of all security equipment and cabling components. The structured cabling system shall be a complete certified system. The system and all components shall be performance matched and guaranteed by the manufacturer.

E. Person / Entity Covered
1. This warranty is for the sole benefit of Owner and any successor in interest to the site in which such Registered SCS was originally installed.
2. All communications work and materials not included in the SCS components shall be warranted by the contractor that performed the work for a minimum of three years from the date of substantial completion.

2.3 MANUFACTURED PRODUCTS

A. Materials and equipment furnished shall be of current production by manufacturers regularly engaged in the manufacture of such items, for which replacement parts shall be available.

B. When more than one unit of the same class of equipment is required, such units shall be the product of a single manufacturer.

D. Manufacturers Qualifications: The manufacturer shall regularly and presently produce, as one of the manufacturer's principal products, the equipment and material specified for this project, and shall have manufactured the item for at least three years.

E. Product Qualification:
1. Manufacturer's product shall have been in satisfactory operation, on three installations of similar size and type as this project, for approximately three years.
2. The University reserves the right to require the Contractor to submit a list of installations where the products have been in operation before approval.

F. Service Qualifications: There shall be a permanent service organization maintained or trained by the manufacturer which will render satisfactory service to this installation within four hours of receipt of notification that service is needed. Submit name and address of service organizations.

G. Equipment Assemblies and Components:
1. Components of an assembled unit need not be products of the same manufacturer.
2. Manufacturer of equipment assemblies, which include components made by others, shall assume complete responsibility for the final assembled unit.
3. Components shall be compatible with each other and with the total assembly for the intended service.
4. Constituent parts which are similar shall be the product of a single manufacturer.

H. Factory wiring shall be identified on the equipment being furnished and on all wiring diagrams.

I. When Factory Testing Is Specified:
1. The Owner shall have the option of witnessing factory tests. The contractor shall notify UH through the Construction Manager a minimum of 15 working days prior to the manufacturers making the factory tests.
2. Four copies of certified test reports containing all test data shall be furnished to UH Public Safety (UHPS), facilities planning and Construction Department (FP&C), Information Technology Communications Services (ITCS), Information Technology Availability Center (ITAC) prior to final inspection and not more than 90 days after completion of the tests.
3. When equipment fails to meet factory test and re-inspection is required, the contractor shall be liable for all additional expenses, including expenses of the Owner.

2.4 EQUIPMENT REQUIREMENTS

A. Where variations from the contract requirements are requested in accordance with Section 00 72 00, GENERAL CONDITIONS and Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES, the connecting work and related components shall include, but not be limited to additions or changes to branch circuits, circuit protective devices, conduits, wire, feeders, controls, panels and installation methods.

2.5 LABELING

A. Install a UH identification tag which clearly indicates information required for use and maintenance of active equipment and spare equipment, coordination for tagging through UHPS and ITCS.

B. Nameplates shall be laminated black phenol resin with a white core with engraved lettering, a minimum of 6 mm (1/4 inch) high. Secure nameplates with screws. Nameplates that are furnished by manufacturer as a standard catalog item, or where other method of identification is herein specified, are exceptions

C. Confirm administrative labeling scheme of cabling and its numerical positions on the termination hardware. Ensure compliance with Owner's preferred administrative labeling standards.

2.6 EQUIPMENT PROTECTION

A. Equipment and materials shall be protected during shipment and storage against physical damage, dirt, moisture, cold and rain:
   1. During installation, enclosures, equipment, controls, controllers, circuit protective devices, and other like items, shall be protected against entry of foreign matter; and be vacuum cleaned both inside and outside before testing and operating and repainting if required.
   2. Damaged equipment shall be, as determined by the ITSC, ITAC, UHPS, FP&C placed in first class operating condition or is returned to the source of supply for repair or replacement.
   3. Painted surfaces shall be protected with factory installed removable heavy Kraft paper, sheet vinyl or equal.
   4. Damaged paint on equipment and materials shall be refinished with the same quality of paint and workmanship as used by the manufacturer so repaired areas is not obvious.

2.7 SPARE PARTS

A. Provide one spare camera for each type of camera utilized on the project.

PART 3 - EXECUTION

3.1 SITE CONDITIONS

A. Existing Site Conditions
   1. Cable pathways and runs to individual outlets are not shown in their entirety but shall be provided as if shown in their entirety. The Contractor shall coordinate with other trades to determine exact routing.

B. Environmental Limitations
   1. Due to the critical nature of the environment, the Contractor shall use extra effort to provide a clean work environment, free from trash/rubbish accumulated during and after cabling installation. Contractor shall remove all rubbish from job site daily at his or her own expense.

3.2 EXAMINATION

A. Examination of buildings and site shall be the responsibility of the Contractor. Examine conditions for compliance with requirements of other sections in which related work is specified and determine if conditions affecting performance of the work of this Section are satisfactory. Do not proceed with work of this Section until unsatisfactory conditions have been corrected in an acceptable manner.

B. Verify liquid-carrying pipes are not installed in or above Electronic Safety and Security equipment rooms.

C. Verify fire-rated backboards are properly installed and painted following Section 06105. Notify the Project Manager immediately and prior to installation in the event that the backboards are not installed or painted properly.

D. Verify conduit, raceways, and boxes are properly installed.

E. Prior to starting the installation, the assigned installation supervisor shall participate in a walk-through of the project site with the Project Manager to review the installation documentation, verify that all construction necessary for the installation has been completed, and verify all installation methods and cable routes.

F. The Contractor shall provide a complete installation according to the written specifications and drawings. If the scope of work to be performed by the Contractor changes, it shall be in writing. Contractor shall respond to these changes with a complete material list, including pricing, labor, and taxes in writing per Division 1 requirements. Contractor shall not proceed with additional scope of work without signed approval by the General Contractor.

3.3 PREPARATION

A. Protection of Surroundings
1. Repair: Patching and repair of facilities, finishes, and equipment. Any damage to building or site caused by Contractor, including grass, paving, curbs etc., shall be restored at Contractor's expense to match condition prior to damage. If necessary and requested by the General Contractor, Contractor shall provide professional services to clean or repair scratched/soiled finishes at their own expense.
2. Contractor shall keep all foods and liquids (water, drinks, etc.) in designated break areas.
3. The Contractor shall obtain the Architect's and Engineer's written permission via the General Contractor before proceeding with any work necessitating cutting into or through any part of building structures such as girders, beams, concrete or tile floors, partition and/or ceilings.
4. If it becomes necessary to cut through any wall, floor, or ceiling to install any work under this Section of the Contract or to repair any defects that may appear up to the expiration of the guarantee period, such cutting shall be done by the Contractor under the supervision of the General Contractor.
5. Patching of all openings cut by the Contractor, or repairing of any damage to the work of other trades caused by cutting or by the failure of any part of the work installed under this Contract, shall be performed by the appropriate trade but shall be paid for by the Contractor.
6. Openings cut through concrete and masonry shall be made with masonry saws and/or core drills and at such locations acceptable to the Architect/Engineer. Impact-type equipment shall not be used except where specifically approved by the Architect/Engineer.
7. All openings shall be restored to “as-new” condition under the appropriate Specification Section for the materials involved, and shall match remaining surrounding materials and/or finishes.
8. Refer to Division 1 for additional information.

3.4 PRODUCT QUALITY ASSURANCE

A. All materials and equipment provided shall be the standard Commercial-Off-The-Shelf (COTS) products of a manufacturer engaged in the manufactures of such products. All materials shall be typical commercial designs that comply with the requirements specified. All materials and equipment shall be readily available through manufacturers and/or distributors. All equipment shall be supplied complete with any optional items required for proper installation.

B. In the event of a breach of the representations and warranties contained herein, the Contractor, at their own expense, shall take all measures necessary to correct and make the Electronic Safety and Security work in compliance with the applicable manufacturer written technical recommendations and standards.

3.5 DEMOLITION / REMOVAL

A. Unless indicated otherwise, all items that must be removed due to interference with work of this contract remain the property of the Owner, and are to be salvaged at the Owner's discretion. Any material to be salvaged, other than Contractor's waste material, must be approved in writing by the General Contractor.

3.6 FIRESTOPPING.

A. The Contractor is required to properly fire-stop any penetrations through fire barriers utilized for the placement of security cabling. Provide fire resistant intumescent materials to restore fire ratings to wall, floor, or ceiling penetrations according to local and national codes.

B. Verify the hourly rating of the barrier.

C. Select the UL Listing to match or exceed the barrier.

D. Adhere to cable loads and fill procedure in the Listing.

E. Seek pre-approval from the Authority Having Jurisdiction (Inspector).

F. When installing the System, be sure not to exceed the listing limitations.

G. After installation, place information labels and take digital photographs of both sides of each firestopped penetration in the System for future reference.

H. All openings shall be restored to “as-new” condition under the appropriate Specification Section for the materials involved, and shall match remaining surrounding materials and/or finishes.

I. Provide fire resistant materials to restore fire ratings to all wall, floor, or ceiling penetrations used in the distribution and installation for security cabling system. Coordinate fire stopping procedures and materials with General Contractor and Div.7.

J. Solutions and shop drawings/submittals for fire stop materials and systems shall be presented to the General Contractor for written approval of materials prior to purchase and installation.

K. Materials shall be installed per manufacturer instructions, be UL listed for intended use, and meet NEC codes for fire stopping measures.

L. The material chosen shall be distinctively colored to be clearly distinguishable from other materials, adhere to itself, and remain resilient and pliable to allow for the removal and/or addition of communication cables without the necessity of drilling holes in the material.

M. The fire stopping material shall maintain/establish the fire rated integrity of the wall/barrier that has been penetrated.

N. Contractor shall coordinate with electrical contractor and ensure Security Pathway firestopping is properly identified and labeled. Contractor shall laminate and permanently affix to each side of a fire wall/floor penetration, the following information:
   1. Installing Contractor's name, address and phone number.
   2. Alpha-numeric unique identifier (floor/penetration - A1)
   3. Name of manufacturer of fire stop system.
   4. Part & model numbers of system and all components.
   5. Phone numbers of manufacturer's corporate headquarters in U.S. and local distributor's name and phone number.

3.7 CONSTRUCTION WASTE MANAGEMENT

A. Contractor shall remove all excess material and debris from the site upon completion of work each day and in a manner approved by the General Contractor's Project Manager. See Division 1.

3.8 CLOSEOUT ACTIVITIES

A. Acceptance shall be subject to substantial completion of all work, successful post-installation testing which yields 100% PASS rating, and receipt of full documentation as described herein.
   1. All Proposal Submittals and Project Record Submittals.
   2. Training to Owner's representative on methods to add and remove fire stop barriers, add and remove isolation conduit seals and add and remove IP 67 rated outlets.
   3. Maintenance manuals specified in Div. 1 to GC and Owner regarding structured cabling system, firestopping and conduit sealing methods and manufacturer's recommended maintenance instructions.
   4. Contractor shall complete all punch list items within five (5) days of notification by GC.

3.9 Contractor shall wipe down all equipment, racks, cabinets, and sweep and mop ER/TR floors prior to Substantial Completion..

3.10 Contractor shall complete Closeout Checklist listing status of all submittals, maintenance manuals, Owner training, and punch list items and deliver per Division 1.

3.11 SINGULAR NUMBER

A. Where any device or part of equipment is referred to in these specifications in the singular number (e.g., "the switch"), this reference shall be deemed to apply to as many such devices as are required to complete the installation as shown on the drawings.

3.12 TRAINING

A. Training shall be provided in accordance with Article, INSTRUCTIONS, of Section 01 00 00, GENERAL REQUIREMENTS.

B. Training shall be provided for the particular equipment or system as required in each associated specification.

C. A training schedule shall be developed and submitted by the contractor and approved by ITCS, ITAC, UH Public Safety Department at least 30 days prior to the planned training.

END OF SECTION

(NOTE TO DESIGNER: These Specifications are basic minimum criteria to be met in preparing the final specifications for this section, which is the responsibility of the Designer.)

SECTION 28 05 26
GROUNDING AND BONDING FOR ELECTRONIC SAFETY AND SECURITY

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Grounding electrodes and conductors.

B. Equipment grounding conductors.

C. Bonding.

D. Communication system grounding.

E. Electrical equipment and raceway grounding and bonding.

F. Control equipment grounding.

1.2 SUMMARY

A. Work covered by this Section consists of furnishing labor, equipment, supplies, materials, and testing unless otherwise specified, and in performing the following operations recognized as necessary for the installation, termination, and labeling of grounding and bonding infrastructure as described on the Drawings and/or required by these specifications.

1.3 RELATED SECTIONS

A. Refer to Section 28 05 00 for detailed information on scope of work.

B. Refer to Section 28 05 53 for all labeling requirements.

C. University of Houston Campus Design Guideline and Standards Security System Standards (latest edition)

1.4 DEFINITIONS

A. MER - Main Equipment Room: The main room, which typically contains the PBX, MDF and main Data Communications equipment.

B. ER - Equipment Room: Any additional room containing switches, hubs, patch panels and cross-connects away from a central location to serve areas out of distance from the MER.

C. TO - Telecommunications Outlet: Point of connectivity for voice, data or video on the wall or in the floor. Refer to Telecommunications Drawings and Symbol sheet(s) for quantities and types of media at each outlet.

D. MDF - Main Distribution Frame: A termination frame for unshielded twisted pair cable, usually providing a connection field for PBX telephone ports and feeder/riser cables to TR's. The MDF is normally located in the MER.

E. IDF - Intermediate Distribution Frame: A termination frame for unshielded twisted pair cabling providing a connection field for horizontal wiring from the workstation and feeder/riser cables extended from the MER.

F. TMGB - Telecommunications Main Grounding Busbar: The dedicated extension of the building grounding electrode system for the telecommunications infrastructure.

G. TGB - Telecommunications Grounding Busbar: The grounding connection point for telecommunications systems and equipment in the area served by an ER.

H. TBB - Telecommunications Bonding Backbone: A bonding conductor that provides direct connection between the TGB's and TMGB.

1.5 REFERENCES

A. Follow Section 01423

B. American Society for Testing and Materials (ASTM):
1. B 3 Soft or Annealed Copper Wires
2. B 8 Concentric-Lay-Stranded Copper Conductors, Hard, Medium Hard, Soft
3. B 33 Tinned Soft or Annealed Copper Wire for Electrical Purposes

C. Institute of Electrical and Electronics Engineers (IEEE):
1. 142-82 Recommended Practice for Grounding of Industrial and Commercial Power Systems
2. 1100 Recommended Practice for Powering and Grounding Sensitive Electronic Equipment in Industrial and Commercial Power Systems.

D. Underwriters' Laboratories (UL):
1. 83 Thermoplastic Insulated Wire and Cables
2. 96 Lightning Protection Components
3. 96A System Installation
4. 467 Grounding and Bonding Equipment

E. National Fire Protection Association (NFPA):
1. 780 Lightning Protection Code
2. 70 National Electrical Code (NEC)
   a. NEC Article No. 250 - Grounding

F. American National Standards Institute/Telecommunications Industry Association/Electronic Industries Alliance (ANSI/TIA/EIA):
1. J-STD-607-A Commercial Building Grounding and Bonding Requirements.
2. Telcordia – Network Equipment Building Systems (NEBS) GR-1275.

G. Building Industry Consulting Services International (BICSI):
1. Telecommunications Distribution Methods Manual
2. Customer Owned Outside Plant Design Manual

H. Local, county, state and federal regulations and codes in effect as of date of “notice to proceed” shall be complied with.

PART 2 - PRODUCTS

2.1 GROUNDING BUSBARS

A. Telecommunications Main Grounding Busbar (TMGB)
1. Chatsworth #10622-012 ground busbar with Chatsworth #10622-000 busbar insulators or equivalent.

B. Telecommunications Grounding Busbar (TGB)
1. Chatsworth #10622-012 ground busbar with Chatsworth #10622-000 busbar insulators or equivalent.

2.2 GROUNDING JOINTS AND SPLICES

A. Grounding conductor joints/splices shall be mechanical type, copper alloy, with a minimum of two bolts and a separate section for each conductor equal to Burndy “QPX”, OZ/Gedney “XTP” or “PMX” or Penn-Union “VX” or copper compression type with two (2) indents equal to Burndy, T&B or Blackburn.

B. Grounding conductor terminations (lugs) shall be single barrel, mechanical screw type, copper alloy with machined contact surfaces equal to OZ type “SL”, T&B, or Burndy or copper compression type with two (2) indents equal to Burndy, T&B or Blackburn.

2.3 BONDING CONDUCTORS

A. Cable Tray Bonding Conductor
   1. Green #8 AWG insulated bonding jumper (12” max) with appropriate lugs or manufactured braided copper grounding jumper equal to B-Line #CAM-GJ, T&B #BD12, OZ/Gedney type “FB” or Mono-Systems.

B. Equipment Frame Bonding Conductor
   1. Panduit #TRGK672 Telecommunications Rack Grounding Kit.

C. Bonding Conductor (BC)
   1. Green insulated copper bonding conductor, size as required by NEC.
   2. The BC shall be, as a minimum, the same size as the TBB.

D. Telecommunications Bonding Backbone (TBB)
   1. Green insulated copper conductor, minimum size of No. 6 AWG. The TBB shall be sized at 2 kcmil per linear foot of conductor length up to a maximum size of 3/0 AWG. Insulation shall meet fire ratings of its pathway.
      a. Table 1
         1) Sizing of the TBB
         2) TBB length (ft) TBB Size (AWG)
            (a) Less than 13 6
            (b) 14-20 4
            (c) 21-26 3
            (d) 27-33 2
            (e) 34-41 1
            (f) 42-52 1/0
            (g) 53-66 2/0
      b. Greater than 66 3/0

PART 3 - EXECUTION

3.1 TELECOMMUNICATIONS INSTALLATION

A. Installation of the TMGB
   1. Install the TMGB at the bottom of plywood backboard near the outside plant entrance conduits in the “MDF”.
   2. TMGB shall be installed so that the BC for telecommunications is as short and straight as possible.
   3. Conductor shall be installed in continuous 3/4” conduit.

B. Installation of the TGB
   1. Install the TGB at the bottom of plywood backboard near the copper riser terminations in each “IDF”.
   2. TGB shall be installed so that the TBB for telecommunications is as short and straight as possible.

C. Installation of the TBB
   1. Install Green insulated copper grounding conductor (refer to 2.03.D for conductor size) from the TMGB to each TGB.

D. Installation of Grounding Conductor Joints/Splices
   1. Install mechanical type, copper alloy, with a minimum of two bolts and a separate section for each conductor or copper compression type with two (2) indents.
   2. Install manufactured insulating cover or heavy tape insulation over joints/splices.

E. Grounding of Cable Tray

1. Install Green #8 AWG bonding jumper (12" max) with appropriate lugs at each cable tray joint or install manufactured braided copper grounding jumper equal to B-Line #CAM-GJ, T&B #BD12, OZ/Gedney type "FB" or Mono-Systems.
2. Install Green #8 AWG grounding conductor with appropriate lugs from side of cable tray down to TMGB or TGB. Drill and tap side of cable tray (for appropriate size bolt, ¼" x 20 min.), making sure that bolt does not extend into wire management part of tray.

F. Grounding of Equipment Frame
1. Install Panduit or equivalent Telecommunications Rack Grounding Kit from equipment frame to grounded cable tray, TMGB, or TGB.

END OF SECTION

(NOTE TO DESIGNER: These Specifications are basic minimum criteria to be met in preparing the final specifications for this section, which is the responsibility of the Designer.)

SECTION 28 05 28
PATHWAYS FOR ELECTRONIC SAFETY AND SECURITY

PART 1 – GENERAL

1.1 SECTION INCLUDES

A. Interior communications pathways and supports.

B. Outlets and conduit runs.

C. Risers in ER/TR(s).

D. Grounding and bonding of pathways.

E. Pathway fire stopping requirements.

1.2 RELATED SECTIONS

A. Section 08 71 00 - Door Hardware.

B. Section 11 12 00 - Parking Control Equipment.

C. Section 14 20 10 - Passenger Elevators.

D. Section 26 05 19 - Low-Voltage Electrical Power Conductors and Cables (600 V and Less).

E. Section 28 05 00 - Common Work Results for Electronic Safety and Security

F. Section 28 05 26 - Grounding and Bonding for Electronic Safety and Security.

G. Section 28 05 53 - Identification for Electronic Safety and Security.

H. Section 28 06 00 - Testing for Electronic Safety and Security.

I. Section 28 13 00 – Access Control.

J. Section 28 16 00 – Intrusion Detection.

K. Section 28 23 00 - Video Surveillance.

L. Section 28 26 00 - Electronic Personal Protection System.

M. Division 27 - Communications

N. University of Houston Campus Design Guideline and Standards Security System Standards (latest edition)

1.3 SUMMARY

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

B. This Section specifies the requirements for the Security Pathways for Communications Systems for University Of Houston (UH) [Project Name] [Insert Project description.].

C. Conduit, cable tray and back boxes for this system shall be furnished and installed by the electrical contractor under the supervision of the security contractor.

D. Security conduit must be properly designed and installed. The design and installation practices for

security conduit have some unique requirements beyond those normally seen in standard electrical conduit.

E. Work furnished and installed by Electrical Contractor as specified in this Section and as shown in E and SC drawings includes:
   1. The conduits and back boxes for the device locations.
   2. Fire stopping of conduit cable pathway

F. Work furnished and installed by the Security Contractor as specified in this section and as shown in E and SC drawings includes:
   1. Access Control, Intrusion Detection and Surveillance End Devices
   2. Cabling
   3. Hardware
   4. Software

PART 2 – PRODUCTS

2.1 GENERAL

A. Conduits must be designed and installed in the most direct route possible from the security room to the device location.

B. The maximum length of LAN copper horizontal distribution cable is 90 meters (295 ft) from the device location to the TR or security room termination point, no exceptions. This applies in particular to IP based CCTV cameras or IP based card readers. Where this length would be exceeded the designer will need to add media converters or additional TR's as required.

C. Security cabling is installed in a home-run fashion with individual cables running from the device location all the way to the security room. Splices in horizontal distribution cable are not allowed.

D. Factory-manufactured sweeps which meet ANSI/TIA/EIA569-A bend radius requirements shall be used for all security conduit.

E. The bend radius of the sweeps must be a minimum of 10- times the internal conduit diameter. Bending conduit in the field using manual or mechanical methods is not acceptable. Standard electrical elbows shall not be used. This sweep radius is necessary to insure that the conduits can accept future cabling. All horizontal conduit shall be tested by the conduit installation contractor with a mandrel to prove compliance with the sweep radius requirements throughout the conduit run.

F. Each security back box shall have an individual conduit routing to the security room, or to the pull box or pulling point, connecting to a major cable pathway routing to the security room. Box shall be located in serviceable space. Looping, or “daisy-chaining,” of conduits between outlet boxes is not allowed.

2.2 CONDUITS AND FITTINGS

A. All conduit ends shall have plastic bushings installed before the cable is pulled into the conduit.

B. Conduits will not be run next to hot water lines, steam pipes, or other utilities that may present a safety hazard or cause a degradation of system performance.

C. Conduits entering the Security Room should be designed and located allowing for the most flexibility in the routing and racking of cables.

D. Conduits or conduit sleeves entering through the floor of the Security Room shall terminate four (4) inches above the finished floor.

E. All metallic security conduits entering the Security Room, Equipment Room, or Entrance Facility shall be bonded together, and bonded to the Main Grounding Busbar with a #6 AWG ground cable.

F. All in-use and spare conduits entering the Security Room, Equipment Room, or Entrance Facility shall be sealed to prevent the intrusion of water, gasses, and rodents throughout the construction project. Within five days of releasing the conduit for the installation of cable, the conduit installation contractor shall prove all conduits to be clean and dry.

G. All conduits and cables that penetrate fire rated walls or floors must be fire stopped.

H. All OSP conduits and inner-duct, used and spare, shall be plugged with watertight plugs at both ends to prevent the intrusion of water, gasses, and rodents throughout the construction project.

I. All OSP conduits shall have pull lines rated at a minimum of 90 kg (200 lb) pulling tension installed. The pull lines must be re-pulled each time an additional cable is installed.

J. Prior to releasing the conduit for the installation of cables, all OSP conduits must be cleaned with a brush pulled through the conduit at least two times in the same direction and swabbed with clean rags until the rag comes out of the conduit clean and dry.

K. All OSP conduits must be tested with a mandrel to prove compliance with the sweep radius requirements throughout the conduit run. Within five days of releasing the conduit for the installation of cable, the conduit installation contractor shall prove all conduits to be clean and dry.

2.3 INSIDE PLANT PULLBOXES

A. Pull boxes used with security conduits in interior locations shall be rated NEMA-1. Pull boxes used in damp or wet locations such as plumbing chases or out of doors shall be rated NEMA-3R. Pull boxes shall be installed in conduits at an interval no greater than every 100 feet. Add appropriately sized pull box shall be installed in conduit runs whenever there are two 90°sweeps, or a total of 180°of sweeps, in a conduit run. Any deviations from these criteria must have prior approval from University of Houston Public Safety (UHPS), Facilities Planning & Construction Department (FP&C).

PART 3 - EXECUTION

3.1 SUMMARY

A. The Inside Plant (ISP) security substructure are the cable pathways and support structures necessary for routing security cabling between security rooms, and from the security room to the device location. There are numerous different products and methods that can be employed to build the substructure. Some of these methods include: Enclosed conduit system, open or enclosed cable trays, routing above a false ceiling using cable supports, and in-slab floor ducts. Security cable pathways shall be separate from IT pathways whenever and where ever possible, if it is necessary to route security cabling in the same cable pathway as IT cables a metallic divider must be installed between the cables.

B. The conduit system shall be routed inside ceilings, floors, and walls to the greatest extent possible. Surface mounted conduit shall be used only when there is no other route to provide service to the desired location.

C. For the main floor in, “slab on grade constructed buildings”, conduit will route in walls and ceilings not in or under the slab. If this design is not possible, an alternate must be presented and approved following the “Approval for Alternate Design Solutions”. If an under slab route solution is approved, the conduit must be installed with at least 1” of concrete encasement around all sides of the conduit.

D. All device locations shall have a minimum ¾" conduit. Increase the conduit size as necessary for the quantity of cables to be installed. Cable fill shall not exceed 40% and plan on 25% growth.

E. Security cable and conduit shall maintain the minimum separation distance from power as listed below.
   1. For power systems operating at 480V or greater, maintain a minimum separation distance of 3m (10 ft) from all security cabling. Pathways should cross perpendicular to electrical power cables or conduits.

2. For large electrical motors or transformers, maintain a minimum separation distance of 1.2m (4 ft) from all security cabling.
3. For lightning protection system conductors (NEC 800-13), maintain a minimum separation distance of 1.8m (6 ft) from all security cabling.
4. For power systems operating at less than 480V, including all conduit and cables used for electrical power distribution, maintain a minimum separation distance of 0.6m (2 ft) from all security cabling. Pathways should cross perpendicular to electrical power cables or conduits.
5. For fluorescent lighting, maintain a minimum separation distance of 12cm (5 in) from all security cabling. Pathways should cross at right angles to fluorescent lighting.
6. For branch circuits (secondary) power (120/240V, 20A) where electric light or power circuits coexist with security cabling, maintain a minimum separation distance of 2in.

END OF SECTION

(NOTE TO DESIGNER: These Specifications are basic minimum criteria to be met in preparing the final specifications for this section, which is the responsibility of the Designer.)

SECTION 28 05 53
IDENTIFICATION FOR ELECTRONIC SAFETY AND SECURITY

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Documentation practices and requirements of cables, termination hardware, patching and cross-connection facilities, conduits, other cable pathways, Security rooms, and other security spaces.

1.2 RELATED DOCUMENTS

A. Drawings and General Provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

B. University of Houston Campus Design Guideline and Standards Security System Standards (latest edition)

1.3 SUMMARY

A. This Section specifies the requirements for the Identification for Communications Systems for the University of Houston [Project Name]. [Insert Project Description].

B. Work covered by this Section shall consist of furnishing labor, equipment and materials necessary for the labeling of the Electronic Safety and Security infrastructure and all security devices as described on the Drawings and/or required by these specifications.

1.4 QUALITY ASSURANCE

A. Identification and administration work specified herein shall comply with the latest applicable requirements of:
   1. ANSI/TIA/EIA - 606-A Administration Standards.
   2. ANSI/TIA/EIA - 569 Pathway and Spaces
   3. ANSI/TIA/EIA - 568-B Telecommunications Cabling Standard.
   4. BICSI Telecommunications Distribution Methods Manual.
   5. UL 969.
   6. University of Houston Information Technology Telecommunication Infrastructure Standards (latest edition)

1.5 SECURITY ADMINISTRATION

A. Administration of the security infrastructure includes documentation of cables, termination hardware, cross- connection facilities, conduits, other cable pathways, security rooms, and other security spaces. All University of Houston (UH) facilities shall apply and maintain a system for documenting and administering the security infrastructure.
   1. In order to create a consistent environment, UH maintains a campus wide numbering scheme for security devices and cable connectivity.
   2. All security devices and cables shall be clearly marked using permanent means. The designation scheme must be consistent with the scheme in use on the campus where the work is being performed. The scheme shall be approved by University Houston Public Safety (UHPS), Information Technology Communications Services (ITCS), prior to installation and use.
      a. Each individual cable shall be clearly marked on both ends.
      b. Multi conductor cables shall have each conductor clearly marked.

1.6 RECORDS

A. A record is a collection of information about or related to a specific element of the security infrastructure. Records must be maintained in a computer spreadsheet, or in a computer database. Paper records are encouraged, but are optional. A cable record is prepared for each cable. The record will show the cable name, and must describe the origin point and destination point of the cable. The cable record will record what services and/or connections are assigned to each conductor or strand. An equipment record is prepared for services distributed from a certain piece of equipment, such as a router, camera, DVR or a system such as data gathering panel.

1.7 DRAWINGS

A. Drawings are used to illustrate different stages of security infrastructure planning, installation, and administration.

B. Installation or Construction Drawings
   1. Installation or construction drawings are the plans that show the installer how the infrastructure is to be installed. The quality of the installation can be directly impacted by the level of detail in the installation drawings and written specifications. Installation drawings for UH projects shall, at a minimum, show pathway locations and routing, configuration of security spaces including backboard and equipment rack configurations, and wiring details including identifier assignments.

C. As-built Drawings
   1. The as-built drawings graphically document the installed security infrastructure through floor plan, elevation, and detail drawings. In many cases, these drawings will differ from the installation drawings because of changes made during construction and specific site conditions. In the as-built drawings, the identifiers for major infrastructure components must be recorded. The pathways, spaces, and wiring portions of the infrastructure each may have separate drawings if warranted by the complexity of the installation, or the scale of the drawings. As-built drawings are a vital component of the security administration system, and must be kept current as adds, moves, and changes take place. UH requires the installer to provide a complete and accurate set of as-built drawings.

PART 2 - PRODUCTS

2.1 LABELS

A. Shall meet the legibility, defacement, exposure and adhesion requirements of UL 969.

B. Approved Manufacturer:
   1. Brady Corporation
   2. Panduit
   3. Equivalent

PART 3 - EXECUTION

3.1 IDENTIFICATION and LABELING

A. To be consistent with ANSI/TIA/EIA standards and industry practices, it is important that labeling be applied to all security infrastructure components. Labeling with the unique identifier will identify a particular component.

B. Labels are generally of either the adhesive or insert type. All labels must be legible, resistant to defacement, and maintain adhesion to the application surface.
   1. Outside plant labels shall be totally waterproof, even when submerged.
   2. All labels shall be machine printed. Hand written labels are not acceptable.
   3. Labels applied directly to a cable shall have a clear vinyl wrapping applied over the label and around the cable to permanently affix the label.

4. Other types of labels, such as tie-on labels, may be used. However, the label must be appropriate for the environment in which it is used, and must be used in the manner intended by the manufacturer.

C. Label all electronic devices, active and spare devices: Camera's, Code Blue phones/call boxes, Alarm system components and DVR and patch panel ports. Provide Card Reader labels on the junction box closest to the Card Readers.
   1. UH device tagging is created by UHPS, ITCS will work in collaboration with UHPS to streamline and create efficiencies as necessary to ensure UH Tagging as required.

D. Where insert type labels are used provide clear plastic cover over label.

E. All labeling shall be coordinated with UHPS, ITCS, Facilities Planning & Construction Department (FP&C) prior to start date.

F. The size, color, and contrast of all labels shall be selected to ensure that the identifiers are easily read. Labels should be visible during the installation of and normal maintenance of the infrastructure.

G. Labels shall be resistant to the environmental conditions at the point of installation (such as moisture, heat, or ultraviolet light), and shall have a design life equal to or greater than that of the labeled component.

END OF SECTION

(NOTE TO DESIGNER: These Specifications are basic minimum criteria to be met in preparing the final specifications for this section, which is the responsibility of the Designer.)

SECTION 28 06 00
TESTING FOR ELECTRONIC SAFETY AND SECURITY

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Deliverables

B. Test Procedures

C. Field Quality Control

D. Manufacturer's Field Services

E. Demonstration

1.2 DELIVERABLES

A. It is essential for UH Facilities Services to receive all test results and as- built drawings prior to job acceptance. The test results must adhere to the following specifications, formats and delivery conditions:
   1. Specifications
      a. Complete end-to-end test results for all copper STP, UTP and fiber optic cables installed are required.
         1) All fiber optic cable must be visually inspected and optically tested on the reel upon delivery to the installation site. Using an Optical Time Domain Reflectometer (OTDR), an access jumper with like fiber, a pigtail, and a mechanical splice, all fibers shall be tested for continuity and attenuation. Testing for continuity and attenuation on the reel must confirm factory specifications to ensure that the fiber optic cable was not damaged during shipment. The test results must match the results of the factory-attached tag on the reel, or the fiber shall not be used. Reel data sheet must be provided showing test results.
         2) End to end (bi-directional) test measurements shall be provided for single mode and multimode fibers (2 wave lengths per test are required). Test results must be submitted for review as part of the installation inspection requirements. Test results shall be in paper form and electronic form, and must contain the names and signatures of the technicians performing the tests.
         3) Testing shall be performed on 100% of the fibers in the completed end-to-end system. ANSI/TIA/EIA-568-A, Annex H, provides the technical criteria and formulae to be used in fiber optic testing. Note however, that all UH fiber must be tested, rated and guaranteed for Ethernet 1000B-X performance. Additionally, all fiber optic cable links must pass all installation and performance tests both recommended and mandated by the cable manufacturer.
         4) 100% of all pairs of copper cables shall be tested for continuity and wire-map.
   2. Format
      a. Test Results must be submitted in both hard and soft copy in a format previously agreed to by the client.
      b. As Built drawings must be submitted with .dgn or .dwg file extensions.
   3. Delivery
      a. Test Results must be both hard copy and electronically submitted to the UH Facilities Department. Contact information will be provided after contract is awarded and before

project completion.

PART 2 - PRODUCTS (NOT APPLICABLE)

PART 3 - EXECUTION

3.1 TEST PROCEDURES

A. Install in accordance with manufacturer's instructions.

B. Field Test Reports: Upon completion and testing of the installed system, test reports shall be submitted in booklet form and electronic media showing all field tests performed on, and adjustments made to each/any component and all field tests performed to prove compliance with the specified performance criteria. Indicate and interpret test results in written form and verbally to owner/consultant for compliance with performance requirements at a pre-scheduled meeting.
   1. Specific test and verification requirements by demonstration or test are as follows. Owner, or Owner's designated representative, reserves the right to witness any and all tests.
      a. Following factory assembly and delivery, the security subcontractor shall individually test each component and sensor and verify the proper functioning of each component within a particular sub-system.
      b. Following installation, individually test each component and sensor and verify the proper functioning of each component within a particular sub-system. Similarly test each sub-system until all detection zones, alarm assessment components, alarm reporting and display, and access control functions have been verified. Prior to final functional and operational tests of the system correct any deficiencies. After sub-system verification is complete, test the entire system to assure that all elements are compatible and function properly as a complete system.
      c. Upon completion of the above outlined tests conduct a formal test to be known as the "System Operational Test", in which all components and sub-systems of the security system are demonstrated to operate together as a system. This test is to be performed over a continuous seventy-two (72) hour period. A formal test plan and test procedures for each portion of the test shall be prepared by the security subcontractor and submitted to the Owner/Architect for approval. The subcontractor must demonstrate that the security system components and sub-systems meet specification requirements in the "As-Installed" operating environment during the "System Operational Test". While no formal environmental testing is required, temperature, humidity and other environmental parameters should be measured and recorded. Include this data in the test report document for the "System Operational Test.

3.2 FIELD QUALITY CONTROL

A. Perform field inspection and testing in accordance with Division 1.

3.3 MANUFACTURER'S FIELD SERVICES

A. Include services of technician to supervise installation, adjustments, final connections, system testing, and to train UH personnel.

3.4 DEMONSTRATION

A. Demonstrate normal and abnormal modes of operation, and required response to each.

B. Provide 8 hours of instruction each for two persons.
   1. Conduct instruction at project site with manufacturer's representative.
   2. Include travel and living expenses for UH personnel.

END OF SECTION

SECTION 28 13 00

ACCESS CONTROL

PART 1 – GENERAL

1.01 SUMMARY

A. Section Includes:
1. Access Control System Software
2. Access Control Head End Equipment
3. Access Control Field and Monitoring Devices

B. Substitutions and Pre-Qualification
1. Access Control System shall be the BASIS Access Control Management System (no substitutions) so as to interface into the Owner's existing BASIS Access/Cougar One Card System, and shall be provided by Stanley Convergent Security Solutions, Inc., Contact: Mr. Terry Clymer, Ph.: 832-289-4538, Fax 713-861-7808, Terry.Clymer@sbdinc.com.

C. Related Sections:
1. Section 08110 – Steel Doors and Frames
2. Section 08210 – Wood Doors
3. Section 08710 – Door Hardware
4. Section 08430 or 0860 – Automatic Entrance Doors
5. Section 14200 – Elevators
6. Section 16050 – Basic Electrical Materials and Methods
7. Section 16100 – Wiring Methods
8. Section 16400 – Low-Voltage Distribution

D. Related Work by Others

1. Door Hardware:
   a. Provide electrified door hardware for all card access doors, and for doors to be electronically locked and unlocked on a time schedule for all leaves.
   b. Provide request to exit switches (REX) on all electrified locking hardware and on all electrified exit devices.
   c. Provide electrified mortise locksets as 24VDC.
   d. Provide electrified latch retraction for all electrified exit devices.
   e. Provide exit device power supplies for all electrified exit devices. Exit device and power supply shall be of same manufacturer.
   f. Provide electric through wire devices for all electrified door hardware.
   g. Provide all electrified door hardware as fail-secure entry with free mechanical egress, except where required to be fail-safe entry according to life safety code and/or local AHJ.

2. Electrical:
   a. Provide dedicated 120VAC power circuits, conduit, raceways, back boxes, j-boxes, fittings, hardware and earth grounds as necessary to provide a complete working system for the access control system. Provide 120VAC connections to access control head end equipment and access control system power supplies and door locking power supplies.
   b. Install power supplies for electrified door hardware, unless otherwise noted.
   c. Provide conduit and back boxes for cable protection within walls, to door jambs, stubbed above drop ceilings, within closed ceilings, where exposed, and penetrating all walls and ceilings. Conduit shall be provided to all access control and security devices, including but not limited to all card readers, electrified door hardware, door contacts,

request to exit devices, system power supplies, power supplies for electrified door hardware and electrified exit devices, automatic door operators and associated controls, vehicle gate operators and associated controls, and all other access control and security related devices.
d. Provide necessary masonry coordination for the back box installations.
e. Patch and paint all items relating to conduit, raceways, J boxes, fittings hardware and earth grounds, conduit, and conduit installations.
f. The installing electrician shall be present during the final walkthrough and system commissioning to resolve any electrical issues.

2. Elevator (only where card access is specified):
    a. Provide and install demarcation box(s) in elevator room.
        1. One dry contact per floor for remote elevator actuation by access system.
        2. One input per floor for elevator indication to access system.
        3. Other inputs/outputs as specified in the drawings and specifications.
    b. Wiring to the Cab
        1. Card Readers as specified by the drawings and specifications.
    c. Life safety, software and testing
        1. Elevator contractor responsible for following all code requirements.
        2. Responsible for all software necessary to interact with all input/output points connected to the access system relating to elevator.
        3. Provide an elevator technician for testing of the interfaces to access system.

4. Automatic Doors:
    a. Provide input interface for the control of the automatic door by card reader.
    b. Provide one contact from each ADA button for interface with the BASIS Access System for “individual” ADA button control by card reader and/or time schedule.
    c. Provide integral electrified door locking mechanisms for automatic “sliding” doors.
    d. Provide integral door monitoring contacts for automatic “sliding” doors.

5. Fire Alarm:
    a. Provide one fire alarm relay with a dry contact at each BASIS Access Control Head End for input to power distribution module(s) that control emergency door release when/if “fail-safe” locks are used.

6. Owner’s Information Services:
    a. Provide network connection to each BASIS Head End and provide static IP addresses.

1.03 SYSTEM DESCRIPTION AND SCOPE OF WORK

A. The BASIS Access Control Management System (as provided exclusively by Stanley Convergent Security Solutions, Inc., to be referred to as “System”) is the existing access control system for the University of Houston Central Campus and utilizes the existing Cougar One Cards (magnetic stripe) with an existing data import script tied to the university’s student and employee database. The System is a sophisticated, multi-tasking, multi-user Access Control Management System and is modular and network capable. The System has the ability of handling multiple sites, controls access with various reader technologies supported simultaneously, includes alarm monitoring with text and graphics based annunciation, and allows for easy expansion or modification of readers, inputs, and outputs.

   The System utilizes an existing central server and is managed under a single software program by the existing BASIS Access Control Server Software, which provides full integration of all system components. Reconfiguration shall be accomplished on-line through

system programming, without hardware changes (except for database, operating system, or technology upgrades by Owner).

B. Access Control Contractor shall provide and install the BASIS System for all specified doors including the following equipment: card readers, intelligent system controllers, system enclosures, card reader panels, input panels, output panels, interface relays, power distribution modules, door contacts, egress motion detectors, exit buttons, door prop horns, key switches, system power supplies, fused relay outputs, back up batteries, and power distribution modules for fail-safe locks only (to be tied into the building fire alarm system).

C. Access Control Contractor shall provide and install all low voltage plenum cabling to access control devices and electrified door hardware, and make all low voltage connections.

D. Access Control Contractor shall provide door lock power supplies if not provided with door hardware in Section 8710 (except for power supplies for latch retraction exit devices, which shall be provided by the door hardware supplier and shall be of the same manufacturer as the exit devices).

E. Access Control Contractor shall provide specified BASIS client software (if specified), and associated training.

1.04 SUBMITTALS

A. Special Submittal Requirements: Combine submittals of this Section with Sections listed below to ensure the design intent of the system/assembly is completely understood and can be reviewed together.
1. Section 08110 – Steel Doors and Frames
2. Section 08210 – Wood Doors
3. Section 08710 – Door Hardware
4. Section 08430 or 0860 – Automatic Entrance Doors
5. Section 14200 – Elevators
6. Section 16050 – Basic Electrical Materials and Methods
7. Section 16100 – Wiring Methods
8. Section 16400 – Low-Voltage Distribution

B. Product Data: Provide Manufacturer’s Data and Catalog Cut Sheets for all access control equipment.

C. Device Schedules: Submit a schedule of access control devices and security equipment per door and per access control head end.

1.05 QUALITY ASSURANCE

A. Distributor's Qualifications:
1. Company shall be certified as an authorized dealer on the BASIS System.
2. Company shall have with a minimum of 5 years experience with the BASIS System.
2. Company shall provide programming only by factory trained technicians.

B. Arrange with the General Contractor for a coordination meeting with all subcontractors and material suppliers involved with the access control including doors, frames and door hardware supplier(s), elevator, automatic doors, entrances, electrical, and Owner’s information services.

C. Review Submittals for doors, entrances and builder's hardware to confirm that adequate provisions will be made for proper installation and function for access control and door monitoring.

1.08 WARRANTY:

A. Warranty materials, fabrications, and installation for a period of 12 month upon substantial completion using factory-authorized service representatives.
   1. Owner shall notify Access Control Contractor by phone immediately upon noticing a security system problem, and Stanley shall respond (during normal working hours, 8 am to 5 pm, Monday through Friday, excluding holidays or weekends), with a phone response within 2 hours after notification, and onsite technician response within 24 hours of notification. After hours, emergency, weekend, or holiday response shall be at additional cost.
   2. Access Control Contractor shall not be required to replace or warrant damage due to misuse, abuse, abnormal use, negligence, acts of God or vandalism.
   3. Access Control Contractor shall not be responsible for warranty, repair, or troubleshooting of any equipment provided by others.
   4. Access Control Contractor shall not be responsible for any existing field devices/equipment that is not functional for whatever reason.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Stanley Convergent Security Solutions, Inc. is the sole supplier for the BASIS Access Control Security System (no substitutions).

2.3 SYSTEM COMPONENTS

A. BASIS Access Control System Software

   1. BASIS Access Control Server and Server Software – System shall utilize the existing Cougar One Card Access Control Server, Operating System, Database, and existing BASIS Access Control Server Software.

   2. BASIS Access Control Client Software – Provide optional cost per client license, plus training cost. To be specified if building user needs to add, modify, or delete cardholders, access levels, time schedules for access or door lock/unlock intervals, for monitoring of door alarms, and running access control and alarm monitoring reports.

   3. BASIS Area Access Manager Software – Provide optional cost per client license, plus training cost. To be specified if building user only needs to add existing cardholders to existing access levels, and run reports on assigned readers/doors.

B. BASIS Access Control Head End Equipment – as required for specified field devices on plan drawings. Locations shall be in MDF or IDF Rooms, as specified on plan drawings.

   1. Intelligent Dual Reader Controllers (IDRC) – BASIS Dual Reader Controller, BAS-2220
      a. On-board Ethernet 10/100Base-T port, RS232 port, and RS485 port.
      b. Two (2) Reader ports.
      c. Two (2) Electric Lock Output (one per door), Form-C outputs, 5 A at 30 VDC.
      d. Two (2) Auxiliary Output (one per door), Form-C outputs, 5 A at 30 VDC.

e. Two (2) Door Contact supervision (open/closed) (one per door).
f. Two (2) REX (request to exit) Monitor (one per door).
g. Individual extended held open and strike times (ADA required).
h. 6 MB of available on-board, non-volatile flash memory.
j. Provide one controller per MDF or IDF Room, or connect to existing BASIS controller if applicable.

2. Single Reader Interface Panels (SRI) – BASIS Single Reader Panel, BAS-1300
   a. One Reader port.
   b. One Electric Lock Output (one per door), Form-C output, 5 A at 30 VDC.
   c. One Auxiliary Output (one per door), Form-C outputs, 1 A at 30 VDC.
   d. One Door Contact Supervision (open/closed).
   e. One REX (request to exit) Monitor.
   f. Individual extended held open and strike times (ADA required).

3. Dual Reader Interface Panels (DRI) – BASIS Dual Reader Panel, BAS-1320
   a. Two (2) Reader ports.
   b. Two (2) Electric Lock Outputs (one per door), Form-C outputs, 5 A at 30 VDC.
   c. Four (4) Auxiliary Output (one per door), Form-C outputs, 5 A at 30 VDC.
   d. Two (2) Door Contact Supervision (open/closed) (one per door).
   e. Two (2) REX (request to exit) Monitor (one per door).
   f. Individual extended held open and strike times (ADA required).

4. Input Modules (IM) – BASIS Input Panel, BAS-1100
   a. Line Supervision.
   b. Sixteen (16) programmable supervised or non-supervised contacts.
   c. Two (2) Form-C 5 A, 30 VDC Relay output contacts.
   d. Two (2) dedicated inputs for tamper and power failure status.
   e. Door Monitoring, Alarm Monitoring, and Elevator Control inputs.

5. Output Modules (OM) – BASIS Output Panel, BAS-1200
   a. Sixteen (16) Form-C 5 A, 30 VDC programmable relay outputs.
   b. Two (2) dedicated digital inputs for tamper and power failure status.
   c. Door Control and Elevator Control outputs.

6. System Power Supplies (SPS) – Altronix (model number as required)
   a. Amperage based on connected equipment.
   b. Provide with 25% spare capacity.
   c. Provide fused outputs.
   d. Provide battery backup for up to 4 hours.
   e. Provide lockable enclosures as required.
   f. Provide system power supplies separate from lock power supplies.

7. Interface Relays (IR) – Altronix, GE, or Honeywell
   a. 12 or 24VDC relay coil.
   b. Output voltage and current rating as required for interface.
   c. For use with automatic door, elevator, or vehicle gate controls interface.

8. Lockable System Enclosures (BASIS Head End) – BASIS BAS-CTX-6
   a. Lockable Metal Enclosure.
   b. Supports up to six (6) BASIS panels per enclosure.
   c. Provide sufficient enclosures for connected equipment.

9. Power Distribution Modules (PDM) – Altronix MOM5
   a. Five (5) Individual Outputs (one per locking device).
   b. Input from fire alarm system disables power to all connected devices.

c. For use with “fail-safe” locking devices only.
d. Fire Alarm Relay provided by others next to BASIS Head End.

B. BASIS Access Control Field and Monitoring Devices – as shown on plan drawings.

1. Card Readers, Magnetic Stripe (CR-MS) – Magnetic Stripe Readers, BAS-2010BK
   a. Fully weatherized metal casing, black.
   b. Bi-directional high coercivity magnetic card swipe.
   b. One million card pass read head.
   c. Maximum 500 feet (152 m) distance from reader interface panel.
   d. Provide with backplate or weather shield as required.
   e. Used at all card access doors for use with UH Cougar One Card.
   f. Provide with keypad option if specified on plan drawings.

2. Card Readers, Proximity (CR-PR) – HID Proximity Readers (no substitution).
   a. HID #5395 Thin Line Readers for use with single gang back boxes.
   b. HID #5365 Mini-Prox Readers for use when mounted on aluminum mullions.
   c. Maximum 500 feet (152 m) distance from reader interface panel.
   d. Proximity readers shall be used only at ADA entrances (in addition to magnetic stripe readers). Proximity readers are for use with special UH formatted HID proximity cards issued to disabled students, faculty, and/or employees in order to operate automatic openers for after hours access.
3. Egress Motion Detectors (EMD) – Bosch, GE, or Honeywell
   a. Egress passive infrared detector.
   b. Adjustable zone detection for egress.
   c. Unlocks or shunts door automatically.
   d. Hands free.
   e. Provide only when integral request to exit function is not provided with electrified door hardware.
4. Exit Buttons (EB) – Alarm Controls, Locknetics, or Securitron
   a. Double pole (DP) contacts – connect one pole directly to magnetic lock power, and connect one pole as request to exit to BASIS System.
   b. Provide 30 second pneumatic delay(not dependent on electronics to operate).
   c. Provide 2” min. red mushroom button with exit signage “Push Button to Exit”.
   d. Provide only for use with magnetic locks, in addition to egress motion detector.

5. Door Contacts (DC) – Bosch, GE, or Honeywell
   a. Concealed 3/4" or 1” diameter (surface mount where concealed is impractical).
   b. Self-lock mounting.
   c. Rugged construction.

6. Door Prop Horns (DPH)
   a. Decibel level as specified on plan drawings.
   b. 12VDC power.

7. Key Switches (KS) – Best Access (no substitutions)
   a. Maintained or momentary key switch functions.
   b. Accepts Best Access key-removable core (UH keying system standard).
   c. Single, double, or triple pole, depending on the interface.
   d. Voltage and current rating, depending on the interface.
   e. Used for interface with door prop horns, automatic doors, emergency override.

PART 3 – EXECUTION

3.01 INSTALLATION:

A. COORDINATION

1. Coordinate meeting with all subcontractors and material suppliers involved with the access control including doors, frames and door hardware supplier(s), elevator, automatic doors, entrances, electrical, and Owner's information services.

B. INSTALLATION STANDARDS

1. Install access control system components per manufacturer's instructions and recommendations.

C. ACCESSIBILITY

1. Comply with ANSI A117.1 Accessibility Standard requirements for disabled.

D. CABLING

1. Install plenum cabling and wiring in raceways (by electrical contractor), and with j-hooks above drop ceilings, without damaging conductors, shield, or jacket.

E. LABELING

1. Label access control panels with access door information provided by Owner.

F. PROGRAMMING

1. Program all system and door set up information.
2. Owner shall program all cardholders and access levels.
3. Owner shall provide final door labeling information for programming.

G. FIELD QUALITY CONTROL

1. Engage a factory-authorized service representative to test and adjust field-assembled components and equipment installation, including connections**,** and assist in field testing.

H. ACCEPTANCE TESTING

1. Operational Test and Acceptance: With Owner and General Contractor representatives, after installation of access control equipment, cables and connections, demonstrate system capability and compliance with requirements. Acceptance of access control system shall be independent of equipment or services provided in other sections or by Owner.

END OF SECTION 13750

(NOTE TO DESIGNER: These Specifications are basic minimum criteria to be met in preparing the final specifications for this section, which is the responsibility of the Designer.)

SECTION 28 16 00
INTRUSION DETECTION

PART 1 – GENERAL

1.1 SECTION INCLUDES

A. Intrusion detection devices.

B. Alarm control panel.

C. Signaling devices.

1.2 RELATED SECTIONS

A. 08 71 00 - Door Hardware.

B. 11 12 00 - Parking Control Equipment.

C. 14 20 10 - Passenger Elevators.

D. 26 05 19 - Low-Voltage Electrical Power Conductors and Cables (600 V and Less).

E. 28 05 00 - Common Work Results for Electronic Safety and Security

F. 28 05 26 - Grounding and Bonding for Electronic Safety and Security.

G. 28 05 28 - Pathways for Electronic Safety and Security.

H. 28 05 53 - Identification for Electronic Safety and Security.

I. 28 06 00 - Testing for Electronic Safety and Security.

J. 28 16 00 – Intrusion Detection.

K. 28 23 00 - Video Surveillance.

L. 28 26 00 - Electronic Personal Protection System.

M. Conduit, cable tray and back boxes for this system shall be furnished and installed by the electrical contractor under the supervision of the security contractor.

O. See Division 26 for all information relating to the fire alarm system and required relay interface to release emergency delay exit doors. The fire alarm integrator shall provide the control relays as required.

1. See Division 26 for all specifications governing the performance of work associated with the installation of raceway, system junction and pull boxes and device rough-in boxes for all work shown in the Access Control System refer to the security drawings.

1.3 REFERENCES

A. NFPA 70 - National Electrical Code; National Fire Protection Association.

B. NFPA 72 - National Fire Alarm Code; National Fire Protection Association.

C. University of Houston Campus Design Guideline and Standards Security System Standards (latest edition)

1.4 INTRUSION DETECTION

A. Door status switches at card reader controlled locations serve to indicate the open/closed status of the associated door and shall establish the basis for reporting a door-propped or unauthorized entry condition.

B. Door status switches at lock secured locations serve to indicate the open/closed status of the associated door and shall establish the basis for reporting an unauthorized entry condition.

C. Passive Infrared (PIR) Detectors in key entry and hallway locations serve to establish the basis for reporting an unauthorized in-building movement after hours.

D. Security contractor is responsible for coordinating the contact configuration single pole single throw (SPDT) Double Pole Double Throw (DPDT) and rating for door status switches, and for connection of switches with the ACID.
   1. Request-to-exit devices at designated card reader controlled doors shall cause the associated door status switches to be shunted. The alarm shunt shall not affect the supervision of the alarm detection circuit.
   2. The data gathering panels shall be locked units equipped with internal tamper switches to report unauthorized access. Each panel shall be independent of the central server and capable of processing and storing requests for access even if the central server is temporarily out of service. The panel shall have LAN interface to facilitate communication with the main server and workstations.

E. Designated positions to have duress buttons: designated positions which report on the existing campus central alarm monitoring and control system. Work per this section shall include the installation of duress buttons, end of line supervision modules, wireways and required wiring.

1.5 SYSTEM DESCRIPTION

A. This Section specifies the requirements for the Intrusion Detection system for the University of Houston [Project Name]. [Insert Project description.].

B. Intrusion Detection System: Protect building and selected areas from intrusion during SECURE hours as follows:
   1. Exterior Doors: Per University of Houston Standard.
   2. Interior Passive Infrared Detectors: Per University of Houston Standard.
   3. Duress Buttons

1.6 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Shop Drawings: Indicate system wiring diagram showing each device and wiring connection required.

C. Product Data: Provide electrical characteristics and connection requirements.

D. Test Reports: Indicate satisfactory completion of required tests and inspections.

E. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, installation, and starting of product.

F. Project Record Documents: Record actual locations of initiating devices, signaling appliances, and end-of-line devices.

G. Operation Data: Operating instructions.

H. Maintenance Data: Maintenance and repair procedures.

1.7 QUALITY ASSURANCE

A. Conform to requirements of NFPA 70.

B. Conform to requirements of University of Houston Police Department.

C. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience and with service facilities within 100 miles of Project.

D. Products: Furnish products listed and classified by Underwriters Laboratories Inc. as suitable for purpose specified and indicated.

1.8 MAINTENANCE SERVICE

A. Furnish service and maintenance of intrusion detection system for one year from Date of Substantial Completion.

1.9 EXTRA MATERIALS

A. See Section 01600 (01 6000) - Product Requirements, for additional provisions.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Intrusion Detection System:
   1. DSC; Product as required to integrate with existing Campus System.
   2. Substitutions: See Section 01 6000 - Product Requirements.

2.2 ALARM CONTROL PANEL

A. Control Panel: Modular construction with flush wall-mounted enclosure.

B. Power supply: Adequate to serve control panel modules, remote detectors, and alarm signaling devices. Include battery-operated emergency power supply with capacity for operating system in standby mode for 24 hours.

C. System Supervision: Provide electrically-supervised system, with supervised alarm initiating and alarm signaling circuits. Component or power supply failure places system in alarm mode.

D. Initiating Circuits: Supervised zone module with alarm and trouble indication.

E. Signal Circuits: Supervised zone coded signal module, sufficient for signal devices connected to system; occurrence of single ground or open condition places circuit in trouble mode and do not disable that circuit from transmitting alarm.

F. Remote Station Signal Transmitter: Electrically supervised, capable of transmitting alarm and trouble signals over telephone lines to central station receiver.

G. Auxiliary Relays: Provide sufficient SPDT auxiliary relay contacts for each detection zone to provide accessory functions specified.

H. Occupied/Unoccupied Selector: Per University of Houston Standard.

I. Entry and Exit Time Delays: Per University of Houston Standard

J. Trouble Sequence of Operation: Per University of Houston Standard.

K. Alarm Sequence of Operation: Actuation of intrusion detecting device places system in alarm mode, which causes the following operations:
   1. Sound and display local alarm signaling devices with non-coded signal.
   2. Transmit non-coded signal to municipal connection.
   3. Indicate location of actuated device on control panel and on remote annunciator panel.
   4. Zone Bypass Switch
   5. Keyed Bypass Switch

6. Alarm Reset: Key-accessible reset function resets alarm system out of alarm if alarm initiating circuits have cleared.
7. Audible Alarm Sequence: Per University of Houston Standard
8. Lamp Test: Manual lamp test function causes alarm indication at each zone at control panel and at annunciator panel.

2.3 INITIATING DEVICES

Alarm System Components:

Part	Manufacturer	Description/Part Number
T-Link TL250	DSC	T-Link Starter Kit
LCD Keypad	DSC	PK 5500
Zone Expander Card	DSC	PC 5108
Accessory Kit	DSC	ACCK-1
Power Adapter/ ACCK1	DSC	PTD164DU-CC
Wireless Receiver	DSC	RF 5132-433
Panic Buttons	DSC	WS 4938 – One Button
Motion Detectors	DSC	EC – 300D
Wireless Receiver Card	DSC	PC 5320 Multiple Rcv Card
Door Contact	DSC	SM35W Surface Mount
Door Contact	DSC	DC 1641 W Flush Mount
Door Contact	DSC	OCD59A Overhead Door
Cable	Lake	P224C 22 AWG 2pr Plenum
Cable	Lake	P224C-09 22 AWG 4pr Plenum

2.4 SIGNAL DEVICES

A. Alarm Bells: NFPA 72, electric vibrating, 8 inch (200 mm) bell with operating mechanism behind dome. Sound Rating: 81 dB at 10 feet (3 M).

B. Remote Annunciator: Provide supervised remote annunciator including audible and visual indication of intrusion by zone, and audible and visual indication of system trouble, in flush wall-mounted enclosure.
   1. Product: Lenel or approved alternative.
   2. Duress buttons with connecting wiring
   3. Substitutions: See Section 01 60 00 - Product Requirements.

C. Duress Button
   1. Recessed button prevents accidental activation.
   2. Latching switch action with manual reset
   3. Switch configuration to be SPDT
   4. Screw wiring termination
   5. UL listed

PART 3 EXECUTION

3.1 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Use 18 AWG minimum size conductors for detection and signal circuit conductors. Install wiring in conduit.

C. Make conduit and wiring connections to door hardware devices furnished and installed under Section 08 71 00.

3.2 FIELD QUALITY CONTROL

A. Perform field inspection and testing in accordance with Section 01 40 00.

B. Test in accordance with NFPA 72.

3.3 MANUFACTURER'S FIELD SERVICES

A. Provide the services of the manufacturer's technical representative to prepare and start systems.

B. Include services of technician to supervise installation, adjustments, final connections, system testing and University of Houston training.

3.4 DEMONSTRATION

A. Demonstrate normal and abnormal modes of operation, and required responses to each.

B. Provide four (4) hours of instruction each for two persons.
   1. Conduct instruction at project site with manufacturer's representative.
   2. Include travel and living expenses for University of Houston personnel.

END OF SECTION

(NOTE TO DESIGNER: These Specifications are basic minimum criteria to be met in preparing the final specifications for this section, which is the responsibility of the Designer.)

SECTION 28 23 00
VIDEO SURVEILLANCE

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Cameras.

B. Control equipment.

C. Cable and accessories.

1.2 RELATED SECTIONS

A. Section 08 71 00 - Door Hardware.

B. Section 11 12 00 - Parking Control Equipment.

C. Section 14 20 10 - Passenger Elevators.

D. Section 26 05 19 - Low-Voltage Electrical Power Conductors and Cables (600 V and Less).

E. Section 28 05 00 - Common Work Results for Electronic Safety and Security

F. Section 28 05 26 - Grounding and Bonding for Electronic Safety and Security.

G. Section 28 05 28 - Pathways for Electronic Safety and Security.

H. Section 28 05 53 - Identification for Electronic Safety and Security.

I. Section 28 06 00 - Testing for Electronic Safety and Security.

J. Section 28 13 00 – Access Control.

K. Section 28 16 00 – Intrusion Detection.

L. Section 28 26 00 - Electronic Personal Protection System.

M. University of Houston Campus Design Guideline and Standards Security System Standards (latest edition)

N. Conduit, cable tray and back boxes for this system shall be furnished and installed by the electrical contractor under the supervision of the security contractor.

O. See Division 26 for all information relating to the fire alarm system and required relay interface to release emergency delay exit doors. The fire alarm integrator shall provide the control relays as required.
   1. See Division 26 for all specifications governing the performance of work associated with the installation of raceway, system junction and pull boxes and device rough-in boxes for all work shown in the Access Control System refer to the SC series security drawings.

1.3 REFERENCES

A. NFPA 70 - National Electrical Code; National Fire Protection Association; 2005

B. EIA/TIA-569 Standard, Commercial Building Standard for Telecommunications Pathways and Spaces

C. EIA/TIA-607 Commercial Building Grounding and Bonding Requirements for Telecommunications

D. National Electrical Code (NEC) (Latest revision and pertinent addendums)

E. National Fire Protection Association (NFPA) Publications (Latest revisions and pertinent addendums)

F. Americans with Disabilities Act (ADA)

G. NFPA 101, National Fire Protection Association

H. UL 294, Underwriter's Laboratories Access Control Systems

I. UL 1037, Underwriter's Laboratories Anti-Theft Alarms and Devices

J. UL 1076, Underwriter's Laboratories Propriety Burglar Alarms Units and Systems

K. EIA-RS-170 Broadcast Standards

L. NTSC Color System Standards

M. Building Officials and Code Administrators International, Inc. (BOCA) National Building Code

N. Uniform Building Code (UBC)

O. Local Governing Authorities Having Jurisdiction

1.4 CONTRACT DOCUMENTS

A. All work of this Section shall comply with the requirements of the Conditions of Contract (including: Bidding requirements, Contract forms, Conditions of Contract and Standard forms), with all Specification Sections of Division 1 General Requirements, with the Drawings, and with all other Contractual Documents.

B. Coordinate with other Division sections as required.

1.5 SYSTEM DESCRIPTION

A. This Section specifies the requirements for the Video Surveillance system for the University of Houston [Project Name]. [Insert Project description.].

A. Scope of Work

1. The work detailed by these specifications and drawings has been specified to meet certain requirements for performance. Some information, such as exact equipment layout, wire routing, additional conduit and power requirements, etc. has been omitted. It shall be the responsibility of the Contractor to translate these specifications and drawings into a complete design package containing all necessary elements for a complete turnkey installation including all material, labor, warranties, shipping and permits.
2. Work shall include the installation and commissioning of the following:
    a. Video Surveillance System (VSS)
3. Work to include, but not limited to the following:
    a. Perform camera pre-installation sign-off walk through with Owner and Security Consultant.
    b. Installation of cameras and camera cabling
    c. Provide all required software and licenses to the Owner.
    d. Contractor shall provide continuous on-site supervision of the installation technicians. On-site supervision shall include: daily supervision of the work, updating work site progress drawings to reflect changes and installations details, preparing weekly progress reports and attendance at site coordination meetings as directed by the Owner and Security Consultant.
    e. The Contractor shall provide continuous engineering and programming support during the installation as required to accommodate existing conditions and unforeseen conditions that may arise during performance of the work.
    f. The Contractor shall provide all miscellaneous hardware including cable management devices, termination cabinets, wire and cable labeling materials, fasteners, hangers and brackets as required.
    g. The contractor will coordinate the delivery and storage of all materials, wire, cable,

equipment and miscellaneous hardware.

4. Description: Provide video communications between points of surveillance indicated on Drawings and central monitoring station.
5. The contractor shall provide all materials, equipment, labor and all other incidental material, tools, appliances and transportation as required for a complete and functional video surveillance system (VSS) as described herein and supplementary drawings.
6. General elements of the work shall consist of but not limited to:
    a. Procure all permits and license required to complete this installation.
    b. Submission of Schedule of Values for all equipment, materials and labor.
    c. Attend pre-construction/pre-submittal meeting with Campus Safety Systems Manager and Security Consultant to review design package for security and finish hardware.
    d. Submittal preparation and processing prior to ordering equipment.
    e. Attend finish hardware submittal review meeting.
    f. Coordination of conduit system, raceway and power distribution provided by Division 26 contractors.
    g. Coordination with all trades and Owner representatives as required facilitating the installation of the security equipment including: Door Hardware, Fire Alarm and Electrical Divisions.
    h. Provide security system sensors, cable, connectors, wiring, equipment enclosures and all other materials necessary to complete the security system per the design documents.
    i. Verify conditions and dimensions at the job site prior to installation.
    j. Coordinate all system programming and camera naming with UIT.
    k. Perform pre-installation camera position and view sign off with Campus Safety Systems Manager.
    l. Perform installation according to contract documents and manufacturers recommendations.
    m. Protect new facilities finishes and equipment.
    n. Maintain construction materials and refuse within the area of work.
    o. Clean the work area at the end of each day.
    p. Perform initial testing and adjustments with written reports.
    q. Make final adjustments and calibrations as directed by the Campus Safety Systems Manager
    r. Demonstrate all systems and component operations for final acceptance.
    s. Preparation of O&M manuals and as-built documents for Campus Safety Systems Manager's use.
    t. ~~Provide training for Owner's security staff, facility personnel and technical staff~~.
    u. Provide warranty service for a period of one year from acceptance date.

1.6 SUBMITTALS

A. See Section 01 33 00 - Submittal Procedures.
B. Shop Drawings: Indicate electrical characteristics and connection requirements, including system wiring diagram.
C. Camera/PPF schedule: As further described in UH Telecommunication Infrastructure Standards Section 12.0.2.1 “Camera Model Specifications and Use Requirements” provide a schedule demonstrating that the selected camera and lens at each camera location meets the required use criteria. Schedule shall include all PPF and lens calculations.
D. Product Data: Provide showing electrical characteristics and connection requirements for each component.
E. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, installation, and starting of product.
F. Project Record Documents: Record actual locations of cameras and routing of television cable.
G. Operation Data: Instructions for starting and operating system.
H. Maintenance Data: Routine trouble shooting procedures.

I. The submittal shall be a detailed response describing methods, procedures and specific equipment proposed to conform to the system design detailed in these documents.
J. Submittals shall consist of product data, shop drawings, samples and detailed completion schedules.
K. Partial submittals shall not be accepted without prior approval by Owner. No portion of the work shall commence or equipment ordered until the Owner has approved the submittals.
L. The Contractor shall not be relieved from any contract-required responsibility by the Owner's approval of submittals.
M. Nothing in the specification shall relieve the Security Contractor of responsibility in delivering a functioning turnkey security system.

1.7 SUBMITTAL REQUIREMENTS

A. Product Data
1. Provide Submittals no less than 10 working days after notice to proceed.
2. Submit data in 3-ring binder divided into separate section (Access Control, Video Surveillance, etc.) for each system.
3. Equipment lists and equipment data sheets shall be 8.5" x 11" in size.
4. Each section to include the following:
a. List all system components with an assigned item number, manufacturer, model number and quantities of each.
b. Manufacturer's literature sheets for all materials and equipment, including warranty information and recommended preventative maintenance and spare part inventory recommendations. Literature containing more than one device shall be clearly marked to delineate item(s) included in the work.
c. Clearly indicate color or special finishes.
d. Cable types including manufacturer's verification and acceptance information.
e. General functional description of each system including:
1) Description of operating systems and application software.
2) Power requirements and UPS sizing.
5. Schedule of Values
a. Contractor shall submit in addition to Division 1 requirements, a Schedule of Values, which includes itemized listing of all equipment, materials and labor required for the installation of the VSS as specified herein for Change Order pricing. Listing shall contain: assign item number, item description, item model number, item quantity, unit cost and extended labor, material and installation cost to provide a complete and functional security system. Submit in electronic format (Microsoft Excel).
6. Shop Drawings
a. Provide Shop Drawings no less than 25 working days after notice to proceed.
b. Reproducing Contract Documents for shop drawing is not acceptable.
c. Submit 3 complete sets of shop drawings along with CD-ROM copy to the Security Consultant.
d. Produce all shop drawings on latest version of AutoCAD.
e. Shop drawings to include the following:
1) Drawing legend sheet describing all symbols used on the drawings.
2) Floor plans with all device locations and wiring.
3) Wire runs to include tags for type, gauge, quantities and cable identifiers.
4) System riser diagram indicating all field devices, riser paths and room designations.
5) Block diagram for each system showing: all equipment, interconnections, network connections and data flow.
6) Point schedule-defining interconnection of all inputs and outputs for all equipment including fire alarm interface, data connections and other systems.
7) Schedule of device power requirements, power source and load calculations.
8) Elevations of equipment racks with new equipment.
9) Elevations of electrical closet(s) with security DGP panel, termination enclosure, wire

management, lock power supply(s), UPS, and power routing, etc.

10) Fabrication shop drawings for all custom equipment.

7. Samples
   a. Upon specific request of the Owner and Security Consultant, submit samples of any proposed devices.
8. Resubmitting
   a. Make corrections or changes in Submittals as required by the Security Consultant's stamped instructions and attached comments and resubmit.
   b. Identify changes on resubmittals by clouding. Only indicated changes will be reviewed when resubmitted.
   c. Added drawings shall be clearly identified.
   d. Contractor shall be responsible for project delays caused by rejected submittals.
   e. Security Consultant shall be compensated for additional services for submittals rejected more than twice. The amount of such compensation shall be incorporated by change order and withheld from the Contractor's Application for Payment.

1.8 RECORD DOCUMENTATION

A. Furnish 3 complete sets of record documents.

B. Record documents shall include all revised information provided as submittals and reflect as installed revisions.

C. General Description and Requirements
   1. Record drawings shall consist of As-Built Drawings and Operation and Maintenance Manuals.
   2. Transmit 3 copies of a preliminary draft of the Record Documents to the Owner and Security Consultant prior to final acceptance testing and training.
   3. Update all Record Documents to reflect changes or modifications made during final acceptance testing as required.
   4. Submit 3 sets of final corrected Record Documents to the Security Consultant within 30 days from the date of final acceptance.
   5. As-Built Drawings
      a. Furnish 3 complete sets of as-built drawings along with a complete CD-ROM copy.
      b. Maintain on the job site, current up to date as-built drawings and schedule(s) including most recent changes. Included field notes shall be neat and legible. The Contractor shall make any needed changes to this drawing and schedule set as to accurately depict the as-built condition of the security system as it is installed.
      A. As-built Drawings shall, at a minimum, include the following:
         1) Floor plan drawings (1/8"=1' scale) indicating device location, with device legends indicating manufacturer and model number for each device.
         2) Floor plan drawings (1/8"=1' scale) indicating wire routing or approximate routing for existing wiring. Wiring shall be tagged with cable identifier and terminal strip number, which references wiring schedules.
         3) Mounting details for all equipment and hardware.
         4) Functional block diagrams for each system and subsystem.
         5) Wiring details showing: rack elevations, DGP and support equipment elevations, equipment wiring and terminations and inter-rack wiring.
         6) Typical point-to-point wiring for each piece of equipment and groups of equipment within the system.
         7) Schedule of all devices with associated panel termination, zoning, power circuit numbers, etc.
   6. Operational and Maintenance (O&M) Manuals
      a. Provide 3 complete operation and maintenance manuals for all equipment and devices with project title and contractor's name on cover and spine.

b. Submit operation and maintenance manuals in 3 ring binders.
c. O&M manuals shall include:
    1) Provide table of contents page with tabbed divider sections for each device or system.
    2) Tabbed sections shall include: theory of operation, design philosophy, specific functions and system block diagram.
    3) List of manufacturer's, their local representatives and subcontractors that performed work on the project. List to include contact names, addresses and phone numbers for each.
    4) Custom written instructions and procedures for system operation.
    5) Operator commands.
    6) Start-up and shutdown procedures.
    7) Detailed programming descriptions for each system.
    8) Manufacturer's operation manual for each piece of equipment in the system. Product data sheets are not acceptable.
    9) Custom written quick users guide for inexperienced operators.
    10) System backup disk.
    11) System software licenses.
    12) Equipment list, including a brief description, model, and the total number of each item used in the project.
    13) A separate list of serial numbers for all items used in the system
    14) Copies of all programming specific to the job, including new code, initial parameters, and settings entered on site, etc.
    15) Setup procedures for each component in the system.
    16) Maintenance requirements for equipment, inspections and preventative maintenance schedules.
    17) Final test data (measured levels and other significant operating parameters).
    18) List of system associated mechanical locking keys and tamper resistant hardware types with key codes.

1.9 QUALITY ASSURANCE

A. Conform to requirements of NFPA 70.

B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience and with service facilities within 100 miles of Project.

C. Supplier Qualifications: Authorized distributor of specified manufacturer with minimum three years documented experience.

D. Installer Qualifications: Authorized installer of specified manufacturer with service facilities within 100 miles of Project.

E. Products: Furnish products listed and classified by Underwriters Laboratories, Inc. as suitable for purpose specified and indicated.

F. Contractor Qualifications
    1. An experienced Contractor shall perform the installation. Contractor shall have at least 5 years' experience in the installation of security systems of similar size and scope.
    2. The installation shall be performed by a Contractor licensed by the Texas Board of Private Investigators and Private Security Agencies and shall be bonded and insured.
    3. All installation personnel shall also be licensed as required by local and/or state jurisdictions.
    4. Contractor shall provide all licensing documentation as part of the bid.
    5. Owner's representative may make such investigations as deemed necessary to determine that the Contractor is responsive, responsible and qualified in the area of work contemplated by the contract. In this regard, the security system installation firm shall furnish to the Owner such

information and data as shall be requested for this purpose. Information and data may include (but not necessarily be limited to): Date of organization and/or incorporation and number of years engaged in this business under present firm's names; list of major equipment owned by the company; list of principal personnel who will be involved in the execution of this contract with the experience and qualifications of each person.

6. The Contractor shall provide a project manager that shall be constantly in charge of the VSS installation. The project manager shall be the same person authorized to make decisions and answer questions asked by the Architect and Owner Representatives. The project manager shall also be responsible for system programming, preparation of Operation and Maintenance Manuals, Training, Programs, Schedules and Test Protocols, documentation of system testing, maintenance of Record Drawings and coordination and scheduling of all labor.
7. Provide evidence of site supervisor's qualifications and work history
8. Contractor shall be or have direct relations through their subcontractors, and authorized manufacturer's representatives for all products they furnish or install.
9. Provide documentation that the Contractor and or subcontractor are factory certified to install, program, train and repair all major components or systems to be used in the project.
10. Contractor shall have a local organization capable of providing maintenance and service for the specified system. Facility shall be no more than 100 miles from Owner's site. The security system installation firm shall be capable of providing emergency service on a 24-hour, 7 days a week basis.

1.10 PRODUCT STANDARDS

A. The Contractor will provide all materials, equipment and installation in compliance with the latest applicable standards from ANSI, FCC, ASTM, EIA/TIA, IEEE, NEC, NFPA, NEMA, REA and UL including but not limited to:
   1. EIA/TIA-569 Standard, Commercial Building Standard for Telecommunications Pathways and Spaces.
   2. EIA/TIA-607 Commercial Building Grounding and Bonding Requirements for Telecommunications
   3. ANSI T1.404 (DS3) and CATV Applications
   4. National Electrical Code (NEC) (Latest revision and pertinent addendums)
   5. National Fire Protection Association (NFPA) Publications (Latest revisions and pertinent addendums)
   6. Americans with Disabilities Act (ADA).
   7. In the event of any conflicts between documents referenced herein and the contents of this specification, the Contractor shall notify in writing to Engineer of any such occurrences before the purchase of any equipment, materials and/or installation by the Contractor. The Engineer will notify the Contractor of any actions required to resolve these conflicts. Such actions may include but are not limited to: design changes, equipment, materials and/or installation changes. In any event Contractor shall not supersede specifications and standards from the latest NFPA and NEC publications.
   8. All equipment, materials and articles incorporated in the work covered by this contract are to be new and unused.
   9. The contractor shall provide at installation time the latest current standard model and/or version of all equipment (hardware and software).

1.11 MAINTENANCE SERVICE

A. Furnish service and maintenance of surveillance system for one year from Date of Substantial Completion.

PART 2 PRODUCTS

2.1 COMPONENTS

A. Models:

Part	Manufacturer / Product Lines	Application - Model Choice
IP Security Camera	Pelco / SARIX product line capable of supporting remote focus and analytics including: • Loitering Detection • Camera Tampering • Directional Motion • Object Counting • Object Removal • Stopped Vehicle ***Camera firmware must be capable of supporting all advertised analytics. Firmware version must not be older than two iterations at the time of system installation.	APPLICATIONS: Activity Detection; Recognition; Identification. Model appropriateness depends on the camera's ability to provide adequate Pixels per Foot (PPF). Contact Media and Security Systems for more information (see section 3.0 Contact Information). MODEL SELECTION: Specific models are based on business use requirements as determined by the business owner. — The University of Houston Department of Public Safety. The University of Houston Information Technology Media and Security Systems Group will approve the most appropriate model. The model selection process is based on the following criteria: • PPF — Pixels per foot • Lighting conditions • Environmental Variables • Analytics requirements • Network Impact MULTIPIXEL AVAILABLE CAMERA RATINGS: 0.5 MP 1.3 MP 2.1 MP 3.0 MP
Panoramic IP	Scallop	D7 180 – day time color best suited for indoor with consistent ambient lighting. Suited for Activity Detection in wide open spaces. (does not support motion

		recording) M6-200 – day/night black and white with exceptional detail in low lighting conditions. Suited for Activity Detection in wide open spaces. (does not support motion recording) ***Consult with the UH Campus Safety Systems Manager for final design approval
Specialty Camera License Plate Readers	Axis 2 MP with built-in IR arrays	License Plate Readers; Confined areas under very low light. ***Consult with Campus Safety Systems Manager for final design approval
Specialty Camera License Plate Readers	Pelco	
NVR	Pelco	Pelco DSSRV v2 - Digital Sentry NVR ***Consult with Campus Safety Systems Manager for final design approval

B. PoE Switches. OFOI

C. NVR licenses required for proper surveillance camera operation.

2.2 GENERAL

A. Manufacturer's name and product lines are given in the specifications for the purpose of establishing a standard of performance, quality, style and compatibility with the existing network and surveillance video infrastructure.

B. These specifications list approved equipment types and items. In instances where quantities are not detailed, they shall be obtained from the drawings.

C. Alternatives will only be considered if a unique business requirement cannot be met by the UH IT approved product line, and if specified features are fully supported by the existing infrastructure.

2.3 Video Surveillance System

A. System Description: Provide and install an IP Video Surveillance system including IP cameras, data cabling per division 27, mounts, domes, dedicated security patch panels and any required components/accessories.

B. General
1. Cameras and support wiring to the common equipment location and video processing equipment

in the MDF.
2. Common equipment location with mounting board, support equipment, wire management and power.

C. Video Cameras
1. Camera schedule location, camera view, lens and mounting method are for reference purposes. Contractor is responsible for coordinating these details with Campus Safety Systems Manager and Security Consultant.
2. Contractor is responsible for lens calculation prior to installation of cameras; specify fields of view rather and exact position of cameras.
3. Prior to camera installation, contractor will verify lens placement to optimize view. Refine for local focus and viewing during installation. Final camera position and lens schedule shall be submitted for Security Consultant's approval.

D. Camera Signal Transient/Surge Protection
1. Provide camera transient/surge protection as specified in the drawings and specifications.
2. Protector to guard sensitive electronics against lightning induced surges, electrostatic discharge and ground loop energies.
3. Install at video head end and at all exterior cameras
4. Connect to nearest communication ground bus or proper building ground.

E. Video Camera Power Supply(s)
1. Cameras will be PoE. PoE switches will be OFOI.

2.4 STATIC CAMERA SYSTEM

A. Camera resolutions will be determined by the desired Pixels per Foot to achieve the required level of detail at a specified distance from the area of interest in order to meet a specific application. Applications include: Activity Detection; License Plate Reading; ~~Facial Recognition;~~ and Facial Identification
B. Inherent camera characteristics such as lux ratings, dynamic range; anti-bloom capabilities; and auto black and white mode are solely dependent on the location and environmental conditions of a given deployment.
C. Provide ground isolation transformers as required to eliminate hum bars and ground loops.
1. Pelco IDE20DN-PMO
2. or UH IT approved equal.
D. For outdoor installations, provide adequate surge protection measures to include the following:
1. Float cameras in their housings by using nylon washers.
2. Ground camera casings utilizing building ground.
3. Provide adequate network equipment protection by installing POE circuit protection such as DTK-MRJPOE or approved equal.
E. NVR-DVR recording resolutions must meet pixel per foot camera requirements.
F. NVRs must have a Gigabit uplink on the building's network distribution switch.
G. PoE switch port utilization must not exceed a maximum of 22 cameras per switch and less if other devices are drawing power from this switch. 15.4 watts per port is the minimum requirement. Consult with the UH IT Network Operations group for PoE switch requirements.

2.6 CAMERA VIDEO AND POWER TRANSIENT/SURGEVPROTECTION DEVICE

A. Provide inline camera video signal and power protection at all outdoor camera locations with grounds connected to closest electrical ground as specified in the drawings and specifications

2.7 CAMERA POWER SUPPLY

A. Camera power to be provided by Power over Ethernet (PoE). Adjunct power may be required for enhanced PTZ applications.

2.8 WIRE AND CABLE

A. Category 6 per Division 27 specifications

2.9 ACCESSORIES

A. Rack: Provide free-standing equipment Rack.
   1. Size: 7' x 19” with minimum 6" vertical cable managers on each side.

PART 3 EXECUTION

3.1 INSTALLATION

A. This section covers the general requirements for the installation of the security system by the Contractor.

B. Install in accordance with manufacturer's instructions.

C. The Contractor shall be responsible for providing all wire and cable as required for complete and operational system.

D. All cables must be continuous runs from device location to the final point of termination. No mid run cable splices will be allowed.

E. The cable installation techniques shall be such that the mechanical and communications characteristics of the cables are not degraded at the time of installation. Any special environmental requirements for equipment shall be specified.

F. Distribution of the cabling will be accomplished through cable trays, cable runways, conduit raceways, ducts, core holes, extended columns, false half columns and plenums. Cabling shall be run at right angles. Horizontal cable segments will be placed in cable trays and when they leave cable trays will be supported by distribution rings or J-hooks. Where cables converge at equipment room locations, they will be supported by cable runways and distribution rings. All cable placements shall be based on the enclosed drawings.

G. The contractor shall not place security wiring in the same conduit or raceway with wire for electrical power distribution.

H. Connectors to all devices in system shall be protected against moisture. Approval of the method shall not relieve the contractor of full responsibility for proper application and workmanship of the materials in the manner specifically approved. All connector threads shall be treated with an approved silicone lubricant.

I. The Contractor shall be responsible for providing an approved ground and ground bus bars at all newly installed systems insuring proper bonding to telecommunications facilities. The Contractor shall also be responsible for ensuring ground continuity by properly bonding all appropriate cabling, closures, cabinets, service boxes, and framework. All grounds shall consist of a minimum 6 AWG copper wire and shall be supplied from an approved building ground and bonded to the main electrical ground. Contractor must notify the Owner prior to making any changes in submitted system design and/or installation.

J. All exposed J-boxes or enclosures shall have tamper resistant features and hardware. Tamper resistant fasteners to be Tamper-Proof pin-in-hex or pin-in-torx button head screws.
   1. Use of common wires for input or output circuits is not allowed.
   2. Configure all zones to be normally closed loop with an end of line resistor (EOL) at the most distant point of the zone.
   3. The Contractor shall obtain Owner's permission before proceeding with any work necessitating cutting into or through any part of building structures such as girders, beams, concrete or tile floors and partition ceilings.
   4. The Contractor shall exercise reasonable care to avoid any damage to Owner's property.

Contractor shall be responsible for and repair all damage due to carelessness of workers. Contractor will report to Owner any damage to the building, which may exist or may occur during the occupancy of the quarters.

5. The Contractor shall be responsible for proper electrical grounds.
6. The Contractor shall take necessary steps to ensure that required fire fighting apparatus is accessible at all times. Flammable materials shall be kept in suitable places outside the building.
7. The Contractor shall install the materials in accordance with the manufacturers' specifications.
8. The Contractor shall promptly correct all defects for which the Contractor is responsible.
9. The Contractor shall insure that all records and reports, City relations, engineering, metering, inspections, testing, quality or service standards and safety measures comply with standards applicable for the State of Texas.
10. The Contractor shall coordinate all work with Owner's designated representative.
11. The Contractor shall maintain a work area free of debris, trash, empty cable reels, scrap wire, etc., and dispose of such items on a daily basis.
12. All work shall be done in a thorough and conscientious manner according to industry standards and shall be subject to inspection and acceptance.
13. The Contractor shall be certain that all installation work areas are secure and made safe in accordance with Occupational Safety and Health Administration (OSHA) regulations.
14. The installation crew should include at least one installation supervisor, or lead technician, for on-site management of the project at all times.
15. The Contractor shall be responsible for completing a standardized report form addressing the weekly progress of the installation schedule.
16. The Contractor shall maintain conductor polarity in accordance with industry practices.
17. The Contractor shall provide any necessary screws, anchors, clamps, tie wraps, distribution rings, miscellaneous grounding and support hardware, etc., necessary to facilitate the installation of the distribution system.
18. The Contractor shall be responsible for labeling all cable, distribution devices, enclosures and outlet locations, according to industry standards. Numbering scheme shall be coordinated with Owner's representative before installation.
19. It shall be the responsibility of the Installation Contractor to furnish any special installation equipment or tools necessary to properly complete the installation.
20. The Contractor shall not roll or store cable reels without an appropriate underlay.
21. The Contractor shall not place any distribution cabling alongside power lines, or share the same conduit, channel or sleeve with electrical apparatus.
22. The Contractor shall insure that the maximum pulling tensions of the specified distribution cables are not exceeded at any time during the placement facilities. Failure to follow the appropriate guidelines may require the Contractor to provide additional material and labor necessary to properly rectify the situation. This shall also apply to any and all damages sustained to the cables by the installation Contractor during the implementation.
23. The Contractor shall be responsible for testing all cable prior to the installation of the cable. If the Installation Contractor fails to perform this testing operation, the Installation Contractor shall accept the cable as good and assume all liability for the replacement of the cable should it be found defective at a later date.
24. The Contractor shall plug conduits where cabling has been installed by the Installation Contractor in all equipment rooms and other cable entrance locations with re-enterable duct seal of flame retardant putty.
25. Materials shall be consistent throughout the building. Where two or more units of the same class of equipment are required, these units shall be the product of a single manufacturer and shall be the same product with the same material, model, and manufacturer number.
26. Wiring, materials, and equipment will be delivered and stored in a clean dry space. They will be properly packaged in factory fabricated type containers and protected from damaging fumes, construction debris and traffic until job completion.

27. The wiring, materials, and equipment furnished for this request shall be essentially the standard product of the manufacturer.
28. All wiring, materials, and equipment must be listed and labeled by a nationally recognized testing laboratory.
29. All installation techniques and fixtures shall result in ease of maintenance and ready access to all components for testing measurements. All external screws, nuts, and locking washers shall be stainless steel. No self-tapping screws shall be used unless specifically approved by Owner. All parts shall be made of corrosion resistant material, such as plastic, anodized aluminum or brass. All materials used in installation shall be resistant to fungus growth and moisture deterioration.
30. An inert dielectric material shall separate dissimilar metals apt to corrode through electrolysis under the environmental operating conditions specified.
31. The cable pulling operation shall be performed such that a minimum bending of the cable shall occur in the unreeling and pulling operations. The pulling tension shall not be allowed to exceed the maximum tension specified by the manufacturer of the cable.
32. Jacketing and insulation shall satisfy the Underwriters Laboratories (UL) listed fire rated cable insulation requirements in plenum areas.
33. Any pulling compound or lubricant used in cable installation shall not deteriorate the conductor or the insulation.
34. Parts and components not specifically mentioned in these specifications, which are required to provide a complete unit, shall be included as a part of the equipment to be furnished.
35. Nothing in the specification shall relieve respondents of system package design responsibility, including, but not limited to, all equipment furnished under this contract. The successful respondent is, in all cases, solely responsible for the performance of the delivered system, and for furnishing complete system documentation for each and every part of the system.

3.2 INTERFACES WITH OTHER PRODUCTS

A. Interface installation of video surveillance with security access and intrusion detection systems.

3.3 MANUFACTURER'S FIELD SERVICES

A. Provide the services of manufacturer's technical representative to prepare and start systems and supervise final wiring connections and system adjustments.

3.4 ADJUSTING

A. Adjust manual lens irises to meet lighting conditions.

3.5 DEMONSTRATION

A. Demonstrate system operation and provide two hours of instruction with manufacturer's training personnel.

B. Conduct walking tour of project and briefly describe function, operation, and maintenance of each component.

3.6 WEEKLY CONSTRUCTION MEETING

A. The Security Consultant and/or Owner will hold weekly construction meetings to review the installation schedule. It is mandatory that the Contractor's project manager attend each meeting.

3.7 SITE INSPECTION

A. Continuously verify that the site conditions are in agreement with the Contract Documents and the security system design. Notify Owner's representative immediately of conditions that affect the performance of the installed system.

B. Coordinate any required work that is not specified in the Contract Documents.

3.8 COORDINATION

A. Adequate conduit and back boxes are provided for the specified system installation.

B. Verify value of end of line supervision module with Owner.

C. Adequate power has been provided for the specified system installation.
   1. Verify mounting location of all devices with Owner prior to installation.

3.9 IDENTIFICATION, LABELING AND DOCUMENTATION

A. The Contractor shall label all termination devices, panels, enclosures and equipment rooms. The Contractor will mark each unit with permanently attached markings that will not impair the equipment or present a hazard to maintenance personnel.

B. Place wire identification numbers on each end of all conductors by using sleeve type heat shrinkable markers. Install markers to be readable from left to right or top to bottom. Wire numbers shall be computer printed (Brady TLS2200 with Permasleeve cable marking labels or equivalent). Hand written labels are not acceptable.

C. Mark all spare conductors.

D. If changes occur prior to acceptance testing altering the documentation previously furnished, the contractor shall formally update and reissue the relevant documentation to the Security Consultant and Owner.

E. Security Consultant and Owner will review all documentation for accuracy and completeness and may reject substandard submittals.

F. The Contractor shall establish and maintain complete system documentation, including documentation procedures, operational information, configuration information, historical records, and drawings. Documentation shall include the following:
   1. Floor plan drawings indicating device locations, unique system point numbers with device legends indicating manufacturers and model numbers for each device.
   2. The unique system point number of a device shall identify either through the software or hardwire connection, the specific device or group of devices associated with the unique point number in the system.
   3. Floor plan drawings indicating conduit and wire routing and junction box locations.
   4. Wire routing shall include cable identification and terminal strip numbers.
   5. Mounting details for all equipment and hardware.
   6. Functional block diagrams for each system.
   7. Wiring details showing rack elevations, equipment wiring and terminations and inter-rack wiring.

3.10 SECURITY SYSTEM PROGRAMMING

A. Security System Programming to include commissioning of all controllers, points and related devices.

B. All system programming shall take place in the field to verify Owner-designated zones for all devices. Programming shall be developed with Owner's input and shall not be accepted without Owner's approval.

3.11 WARRANTY

A. The Contractor shall warrant the system for parts and labor for one (1) year. Warranty commences at the time of substantial project completion and acceptance by Campus Safety Systems Manager. Nothing shall be construed to limit this obligation to a shorter period.

B. Warranty service shall be rendered on-site by request of Owner to repair or replace any defective materials, equipment and workmanship without cost to the Owner University , unless the Owner has previously given the Contractor a written acceptance of such condition.

C. The Owner shall give prompt notice of the defect(s) either verbally or in writing to Contractor.

D. Contractor shall purchase and provide to Owner one spare camera per type purchased. Spare cameras will be held by Owner for use by Contractor during warranty period. Contractor to replace spare parts used with new. Spare parts are property of Owner.

E. Perform preventative maintenance during the warranty period, which includes:
   1. Quarterly cleaning and inspection of all devices.
   2. Quarterly inspection, cleaning and testing of all power supplies/UPS.
   3. Quarterly test and replace of batteries as necessary.
   4. Clean and vacuum MDF console and rack equipment
   5. Service technician performing service / warranty work shall check-in and out for each visit.
   6. Provide a written report to Owner documenting any work performed during the warranty period within 24 hours of such event. Report shall detail work performed, equipment repaired or replaced, etc.
   7. Provide loaner equipment which is equivalent to the malfunction equipment for any equipment not field repairable.
   8. Repair or Replacement Service
      a. Repair or replacement service during the warranty period shall be performed 7 days a week, 24 hours a day and with a 4 hour response time.
      b. Emergency repair or replacement service during the warranty period shall be performed 7 days a week, 24 hours a day and with a 1 hour response time.
      c. If the Contractor can not restore system operation during the warranty period within 2 business days of the system failure, the Owner reserves the right to require the Contractor to provide on-site manufacturer's service technicians at no additional cost.
      d. 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 the expansion is performed by an authorized dealer for the affected equipment.
      e. On-line software and hardware service shall be provided and shall be password protected and controlled by the Owner.

3.12 TECHNICAL VERIFICATION SESSION

A. Security system walk through and verification shall be provided for the UIT PM and Campus Safety Manager ~~,~~and shall minimally consist of 4 ea. 1-hour session.

B. A complete product manuals and preliminary as-built drawings shall be delivered to the owner one week prior to the training sessions.

C. Technical verification and walk through shall consist of:
   1. Technical explanation sufficiently thorough that: staff personnel shall be able to identify and trace circuits, analyze malfunctions and make changes as necessary to maintain system operation.
   2. Provide printed reference material for each trainee that documents and explains in technical terms:
      a. System block diagram with technical features
      b. Method and record of end-to-end testing
      c. Review of as-built drawings.
      d. Q & A session.

3.13 SUBSTANTIAL COMPLETION

A. Work must meet the following requirements to qualify for the Owner's consideration of Substantial Completion:
   1. All cameras and monitoring devices shall be fully installed, tested and fully operational
   2. Video cameras powered and focused as approved by the Campus Safety Manager.

3. End to end testing reports produced
4. Technical verification process complete.
5. Owner may utilize the system for its designed intent.
6. Contractor will provide a list of remaining work items and approximate completion date.
7. Contractor will certify in writing that all remaining work is minor in nature and will be completed in less than 30 days.

3.14 TESTING REQUIREMENTS

A. The contractor shall perform sample tests in the presence of the Security Consultant and Owner. Performing the testing procedures specified herein assures that the communication cabling and system electronics meets the performance characteristics specified. All testing shall comply with EIA/TIA Standards and that of the equipment manufacturers. If testing indicates that the performance characteristics are not met, the test shall be failed test and any other test that may be affected by the modification and/or repair shall be rerun and verified.

B. Test equipment will be provided by the contractor to test and to certify the 100% operational condition of all materials and equipment.

C. The Vendor shall prepare and submit all test procedures and data forms for the pre-installation, post installation and subsystem test to Owner. The test procedures shall have Owner approval before the tests.

3.15 SYSTEM CHECK OUT AND VERIFICATION

A. Commission all security devices from field up to and including the head-end.

B. Contractor supplied "As Built" Drawings shall show security conduit routing and cable labeling.

C. Review all as-built and testing documentation with Owner. Revise and reissue as required.

D. Video camera image as received at the head-end is noise free, focused and field of view of view is optimized for intended content.

3.16 ACCEPTANCE OF SYSTEMS

A. Each area of construction completed and submitted as complete shall meet the following criteria under testing:
   1. System must meet all specifications as described in these instructions.
   2. Operational prints, manuals, signal logs, and as built prints must be furnished.
   3. Visual testing and signal verification will be conducted at random locations to determine that equipment performs satisfactorily.
   4. Specifications set forth for construction of the system have been devised in order to insure system compatibility and performance. Compliance to these specifications will be determined during periodic observances of construction. Repeated failure to comply with the specification will be considered before the initial acceptance phase of the plant commences.
   5. Within ten days receipt of the final acceptance notice, the Owner's representatives shall schedule and perform the final inspection. When the work is found acceptable under the contract documents and the contract is fully performed, the project will be declared complete.

END OF SECTION

(NOTE TO DESIGNER: These Specifications are basic minimum criteria to be met in preparing the final specifications for this section, which is the responsibility of the Designer.)

SECTION 28 26 00
ELECTRONIC PERSONAL PROTECTION SYSTEMS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Cameras.

B. Control equipment.

C. Cable and accessories.

1.2 RELATED SECTIONS

A. Section 08 71 00 - Door Hardware.

B. Section 11 12 00 - Parking Control Equipment.

C. Section 14 20 10 - Passenger Elevators.

D. Section 26 05 19 - Low-Voltage Electrical Power Conductors and Cables (600 V and Less).

E. Section 28 05 00 - Common Work Results for Electronic Safety and Security

F. Section 28 05 26 - Grounding and Bonding for Electronic Safety and Security.

G. Section 28 05 28 - Pathways for Electronic Safety and Security.

H. Section 28 05 53 - Identification for Electronic Safety and Security.

I. Section 28 06 00 - Testing for Electronic Safety and Security.

J. Section 28 13 00 – Access Control.

K. Section 28 16 00 – Intrusion Detection.

L. Section 28 23 00 – Video Surveillance

M. Division 27 - Communications

N. University of Houston Campus Design Guideline and Standards Security System Standards (latest edition)

O. Conduit, cable tray and back boxes for this system shall be furnished and installed by the electrical contractor under the supervision of the security contractor.

P. See Division 26 for all information relating to the fire alarm system and required relay interface to release emergency delay exit doors. The fire alarm integrator shall provide the control relays as required.

1. See Division 26 for all specifications governing the performance of work associated with the installation of raceway, system junction and pull boxes and device rough-in boxes for all work shown in the Access Control System refer to the SC series security drawings.

1.3 EMERGENCY COMMUNICATION SYSTEM

A. This Section specifies the requirements for the Emergency Call Box system for the University of Houston [Project Name]. [Insert Project description.].

B. Functional Requirements
   1. The Emergency Communication System (ECS) shall consist of a one button hands-free direct dial communications unit. There are two different types of units one for wall mounting and one stand alone exterior mounting. For ease of identifying these units the wall mount unit shall be designated as a Call Box (CB) and the stanchion mounted exterior unit shall be designated as a Call Tower (CT).
   2. Each CB/CT shall be equipped with a red push button labeled POLICE and a black push button Labeled INFO. The Police push button shall be programmed to dial the campus police 911 line for emergencies. The INFO button shall programmed to dial a number determined for general information requests.
   3. The call boxes shall have a stainless steel faceplate with the two buttons, an LED that illuminates when the call box is answered, for the hearing impaired. It will also be fitted with a vandal resistant speaker grill. The Call Box shall be designed for flush mounting in a back box in wall. A separate blue strobe light shall be wall mounted above the call box as a location identifier. The blue light shall be normally illuminated for unit visibility. Pressing the POLICE button will cause the blue light to flash for the duration of the call. Only when the called party terminates the call will the light stop flashing.
   4. The Call Tower shall consist of the Call Box faceplate mounted in a free standing vandal resistant tower with a blue strobe light mounted on its top. The blue strobe light shall function the same as the Call Box light. The faceplate shall be continuously illuminated by LEDs flush mounted in the tower above the faceplate. The Call Tower shall meet the following minimum specifications:
      a. Dimensions - 12" W X 10" D X 110" H w/ 2" radius corners.
      b. Weight - 450 Lbs.
      c. Construction - .025" steel w/multi-coat rust inhibitive coating
      d. Strobe - 1.5 million candlepower, 70 flashes per minute.
      e. Blue light - 7 Watt high efficiency, 10,000 hour compact fluorescent.
      f. Faceplate - Ultra bright LEDs, 100,000 Hour lifetime.
      g. 120VAC, 5 Amp minimum circuit
      h. Lettering - 3.25" high reflective white letters.
      i. Compliance - CSA Certified to UL Standard 60950.
   5. Camera equipped Call Towers shall be the same tower assembly as the standard unit with the addition of an arm that extends above the tower to support a pendent mounted PTZ dome camera and the blue light.
      a. Each push button shall be provided with a momentary contact, normally open dry contact that shall be wired to an access control panel alarm input to facilitate camera selection through the ACID / DVMS integration.
      b. Each CB shall have a dedicated PBX extension to allow the individual telephone unit to be uniquely identified by the answering party. Actual programming shall be determined by the Owner.
      c. Call Towers shall have an analog adapter to allow a two-way communication via a VOIP system with the campus police office.
      d. All call towers shall be equipped with an IP relay interface to facilitate transmission of the POLICE button alarm contacts over the IP network to the designated equipment room where the IP relay output contact shall be connected to an access control panel alarm input.
      e. Call Towers shall be equipped with a media converter to convert all electrical signals to optical signals for transmission via fiber optic cable the designated equipment room A rack mounted version of the media converter shall reconvert the signals for connection to the Ethernet.

1.4 CONTRACTOR QUALIFICATIONS

A. Contractor shall be a certified Code Blue Phone Reseller and Installer and have the following certification:

1. At a minimum, one (1) on-site personnel shall have appropriate Code Blue Phone certification for installation, programming and troubleshooting.
2. Certification documents shall be included in all Reponses to RFP/RFOs.

PART 2 - PRODUCTS

2.1 MATERIALS LIST

A. Code Blue Call Tower - CB1-e - Interactive Voice Communication Unit

B. Code Blue Call Tower – CB1-wb – Solar/Cellular Interactive Voice Communication Unit

C. Code Blue Wall Mounted Call Box – CB2-e - Interactive Voice Communication Unit

2.2 FINISH

A. The unit housing shall be fabricated of non-magnetic # 304 stainless steel, and shall be power coated after fabrication. The finish shall be uniform and free of visible defects.

2.3 GRAPHICS

A. The graphics shall be cut from a durable engineering grade reflective vinyl for high visibility and legibility.

B. The standard graphics text shall be “Emergency”, “Assistance”, or “Courtesy”, and placed on two sides of wall unit. Standard colors shall be white, blue and black. Customized graphics and colors shall also be available.

PART 3 - EXECUTION

3.1 MOUNTING

A. The column shall include four 5/8” x 16” J-bolts for mounting into a 20” X 20” X 3' concrete foundation. J-bolts shall protrude approximately 2 ½” inches from surface of foundation.

3.2 ELECTRICAL

A. The communication device shall require no external power. The phone line, PBX extension, or a wireless communication interface shall power it. The requirements shall be 30 ma loop current at the unit, with a line resistance of less than 700 OHMS. A 22 to 26 shielded twisted pair cable shall be used. Longer cable runs shall require a heavier gauge cable. Verify manufacture requirements.

B. The unit shall require 120 VAC and draw a maximum of 3 amperes under normal operation, 4 amps with heater.

C. All lamps and fixtures shall be UL. listed. All electrical components shall be hard wired and concealed within the column in aluminum flex conduit. All wiring and electrical fixtures comply with the standards of the National Electrical Code, UL.

3.3 WARRANTY

A. Equipment shall be warranted against any defects in material and workmanship, under normal use, for a period of two years from date of purchase. In the event system is found by manufacturer to be defective within the warranty period, manufacturer shall repair and/or replace any defective parts, provided the equipment is returned to manufacturer.

END OF SECTION

SECTION 28 31 00

ADDRESSABLE DEVICE FIRE ALARM SYSTEM

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

A. The Conditions of the Contract and applicable requirements of Division 1, “General Requirements” govern this Section.

1.2 DESCRIPTION OF WORK:

A. General: The extent of fire alarm system work is as shown and scheduled and includes, but is not limited to, providing a system with the following functions and operations:

1. Provide a complete distributed microprocessor based, 24 volt dc, closed circuit, electrically supervised, addressable device multiplexed fire alarm, and communication system to be wired, tested, and left in first class operating condition. The system shall include, but not be limited to, a control panel with reserve standby power, voice communications system, firefighters' HVAC system override, annunciators, manual alarm stations, ceiling smoke sensors, duct smoke sensors, heat sensors, addressable input and output devices, sprinkler water flow switches, valve supervisory switches, audible and visual alarm indicating devices, raceways, wiring and all hardware and software as required to effect an operational system as herein specified. Each alarm device shall be individually addressable.

2. The system shall operate as a non-coded, continuous sounding system which will sound alarm devices until manually silenced, as herein specified.

3. The fire alarm system shall tie into the existing University of Houston Fire Alarm network. Individual point control, individual point monitoring, and, remote system control (Acknowledge/Silence/Reset) shall be required at existing monitoring locations. Fire alarm graphics will not be required, per University of Houston standard.

1.3 STANDARDS:

A. Products shall be designed, manufactured, tested, and installed in compliance with the latest edition of the following standards:

1. National Fire Protection Association Standards:
   a. NFPA 70 National Electrical Code.
   b. NFPA 72 Installation, Maintenance and Use of Protective Signaling Systems.
   c. NFPA 90A Installation of Air Conditioning and Ventilating Systems.
   d. NFPA 101 Life Safety Code.
   e. NFPA 13 Sprinkler Systems.

2. Underwriters' Laboratories, Inc. Requirements and Listing for use in Fire Protective Signaling Systems as follows:
   a. UL 864 Control Panels.
   b. UL 268 Smoke Detectors - Systems.
   c. UL 268A Duct Smoke Detectors.
   d. UL 217 Smoke Detectors - Single/Multiple Station.

e.	UL 521	Heat Detectors.
f.	UL 228	Door Holders - Closers.
g.	UL 464	Audible Signaling Appliances.
h.	UL 1638	Visual Signaling Appliances.
i.	UL 38	Manual Alarm Stations.
j.	UL UOJZ.	Fire Alarm control unit

3. International Building Code, latest edition and the requirements of state and local authorities having jurisdiction.
4. Comply with requirements of the Americans with Disabilities Act of 1990.
5. State of Licensed refers to State of Texas.
6. AHJ refers to University of Houston Fire Marshal's Office.

1.4 QUALITY ASSURANCE:

A. Manufacturers: The equipment specified herein shall be approved by the AHJ and constitutes the style of operation, quality of construction, features and physical size limitations required for this project.

B. UL and FM-listing: All fire alarm system components shall be UL and FM listed for fire alarm use. The UL listing shall be under category UOJZ to assure that the entire system has been tested as an integral life safety system.

C. All equipment furnished shall be the current standard products of a single manufacturer and shall bear the label of the Underwriters' Laboratories for use in fire alarm system designed in compliance with the requirements of NFPA codes. Raceways, wiring and terminations shall be accomplished in compliance with the requirements of the National Electric Code, Article 760.

D. The system as installed shall, upon completion, be certified by a state licensed fire alarm technician to the Owner as being installed in compliance with the specification, the requirements of all state and local codes, and as being operational and free from defects.

E. All system equipment supplied shall be listed by the Underwriters' Laboratories for NFPA 72 system use, and all applicable NFPA Codes.

F. The installing contractor shall be authorized and designated representative of the fire alarm system manufacturer to sell, install and service the manufacturer's equipment and shall stock the required spare parts to keep the system in operation. The installing contractor shall maintain a staff of specialists for technical assistance and system maintenance.

G. The installing contractor must be licensed by the State Fire Marshal to sell, install, and service fire alarm system as required by Texas Insurance Code Chapter 6002 & 28 TAC the Fire Alarm Rules.

H. The installing contractor shall have on his staff a minimum of five fire alarm technicians who are licensed by the State Fire Marshal's office for such purpose and under whose supervision installation, final connections and check out will take place, as required by the Texas Insurance Code.

I. The installing contractor or equipment supplier shall have a staff a minimum of one certified NICET Level III state licensed fire alarm planner under whose supervision system design shall take place. [In lieu of a NICET-certified state licensed fire alarm planner, the contractor or supplier may provide design by a professional engineer registered in Texas who has demonstrated a thorough understanding of fundamental

systems and practices as they pertain to life safety and to fire protection, detection, alarm, control and extinguishment.]

J. The equipment supplier shall provide 24 hour, 365 days per year emergency service with qualified and state-licensed service technicians.

K. The installing contractor shall have been actively engaged in the business of selling, installing, and servicing microprocessor and multiplex fire alarm systems for at least 8 years and shall have proof of experience in the installation and maintenance of the type of fire alarm system specified herein.

L. The manufacturer or his representative shall maintain within 50 miles of the installation, a staff of factory trained, state licensed fire technicians, together with all support parts necessary for maintenance of the system.

M. Where approved in writing by the system manufacturer and installing contractor, the Electrical Contractor may install all conduit and boxes. The system wiring shall be pulled in by the installing contractor. All system connections, device installation, system start-up and testing shall be performed by the installing contractor. Rough-in by the electrical contractor shall not in any way affect the system manufacturer's and installing contractor's full responsibility for the installed fire alarm system.

N. The manufacturer shall submit legal documentation indicating that the purchased fire alarm equipment will be provided with parts, and support for 10 years after the acceptance by the Owner.

O. Plenum cable is acceptable where allowed by NEC and Authority Having jurisdiction (AHJ). All wiring shall be listed for limited energy fire alarm use and rated for 300 volts minimum.

P. The complete combination fire alarm system shall comply with NFPA 72 National Fire Alarm and Signaling Code, the University of Houston Design Guidelines and Standards, and State of Texas Fire Alarm Rules. Modifications required to provide compliance shall be made at no cost to the Owner. Where Contract Document requirements are in excess of Code requirements the Contract Documents shall govern.

1.5 SUBMITTALS:

A. Shop Drawings submittals shall include, but not be limited to, the following:

1. A written description of the system operation (written in this specification format), with all exception and/or deviations clearly highlighted or identified.

2. A block diagram showing system components, wire runs, wire counts and wire sizes.

3. A control panel layout diagram showing the location of all modules and wiring and interconnection schematics.

4. Calculations justifying battery size, power supply size, amplifier size, voltage drop and wiring sizes based on worst case occurrence.

5. Manufacturer's descriptive literature for all panels, modules and peripheral equipment describing size, color, finish, capacity and electrical characteristics.

6. A complete listing of all associated software showing the relationship of alarm points, control outputs, control inputs and indicators.

7. An alarm matrix showing alarm and control function for an alarm in each

device/zone.

8. Scaled floor plan drawings locating and naming each device and showing wiring and conduit sizes from each device back to the control panel(s).
9. A complete riser/wiring diagram showing zoning and addressing and wiring and conduit sizes from the CPU to all remote terminal units, graphics terminals, CRT displays, printers, and other system devices.
10. Completely identified and marked catalog cuts of all associated equipment and devices, with all non-applicable items crossed out, or applicable devices clearly highlighted and/or identified.
11. Complete and detailed point-to-point wiring diagrams for all devices in the system.
12. Complete Bill of Material for all equipment.
13. A copy of the form to be used for final tests, 100% audit and checkout shall be submitted for approval.
14. Additional information as required in Section 26 01 00.
15. Two hard copy plans and one electronic copy that are stamped and signed by either an Alarm Planning Superintendent or Texas Registered Professional Engineer shall be submitted to AHJ before construction can begin.
16. Contractor must obtain a fire alarm installation permit (permit fee may apply) before construction can begin.

1.6 DELIVERY, STORAGE AND HANDLING:

A. Deliver fire alarm system components in factory-fabricated containers.

B. Store in a clean, dry space and protect from the weather.

C. Handle control and annunciator panels carefully to avoid damage to material components, enclosure and finish.

PART 2 - PRODUCTS

2.1 MATERIALS AND COMPONENTS:

A. General: Provide the required fire alarm system products in the sizes and capacities required or indicated, complying with the manufacturer's published product information of standard materials and components, designed and constructed for the applications indicated.

2.2 FIRE COMMAND CENTER:

A. Controls shall be provided in the Fire Command Center to provide the following functions:

1. The fire alarm system Control Panel, Voice Communications System, and Firefighters' HVAC System Override Panel.
2. A fire alarm system single-mode/multi-mode fiber network communication cards to tie in existing fire alarm network to report point information to the existing monitoring stations.
3. Provisions for the fire alarm system to automatically unlock the Fire Command Station access doors and other locked building access doors (electric locks by Hardware Contractor).

4. Emergency Power System and Transfer Switch Annunciator Panels with signal and status indicators (furnished and installed by the Electrical Contractor).

5. Internal batteries with automatic charger of sufficient size to power the fire alarm system per NFPA 72.

6. Elevator selector controls and status indicator panel (furnished and installed by the Elevator Contractor).

7. Room light fixture with integral battery pack or on emergency power (furnished and installed by the Electrical Contractor).

8. Fire pump status indicator panels (furnished and installed by the Fire Protection Contractor).

9. Emergency Generator key type start control.

2.3 SYSTEM OPERATION:

A. Activation of an "intelligent" smoke detector shall cause the following operations and indications (refer to other paragraphs in this section for additional operations and indications):

1. When an "intelligent" smoke detector senses an abnormal level of smoke, the loop interface module shall automatically initiate a "check" mode. Consecutive samples shall be made of the prospective detector. Upon completion of consecutive smoke trouble conditions, the detector is considered "checked" and the system goes directly into an alarm mode, unless the verification mode is activated for the detector.

2. Alarm verification shall be programmable by detector(s) to initiate a verification sequence after the "check" procedure and the Fire Alarm Control Panel shall be permitted with permission from AHJ. The system common alarm LED on the Fire Alarm Control Panel shall flash. The internal audible trouble device shall sound. Acknowledging the alarm condition shall silence the audible trouble device and revert the flashing common alarm LED to a steady state.

3. An alpha-numeric LCD Display shall indicate all applicable information associated with the alarm condition including: device type, device location and time of alarm. Location and zoning messages shall be custom field-programmed to respective premises.

4. Appropriate status change message(s) shall be transmitted to the monitoring locations located at Police Dispatch and the UH Fire Alarm Shop.

5. Activate all audible alarm devices on general alarm or the floor of alarm, the floor above and the floor below with a prerecorded alarm message. General or selective evacuation shall be determined by the AHJ during the submittal process.

6. Activate all visual alarm devices on general alarm or the floor of alarm, the floor above and the floor below. General or selective evacuation shall be determined by the AHJ during the submittal process.

7. Activate addressable output relays to unlock all locked security doors.

8. Activate addressable output relays to unlock electric door strikes at the Fire Command Center.

B. Activation of any addressable manual pull station, beam smoke detector, sprinkler waterflow switch or "intelligent" heat detector shall cause the following operations and indications (refer to other paragraphs in this section for additional operations and

indications):

1. Cause all operations and indications described in Paragraph 2.3/A.3 through 2.3/A.8 to occur.

C. Activation of an elevator machine room or shaft heat detector shall cause the following operations and indications:

1. Cause all operations and indications described in Paragraph 2.3/A.3 through 2.3/A.8 to occur.

2. Initiate via an addressable output relay, the shunt tripping of power to each elevator machine.

D. Stairwell pressurization fans shall be started via addressable output relays with status verification via differential pressure switch and addressable input whenever any sprinkler waterflow switch or any two smoke detectors on a single floor are activated. The alpha-numeric display shall indicate stair pressurization fan operation and the firefighters HVAC override panel shall show fan status.

E. Elevator recall shall be initiated via addressable output relays when any smoke detector elevator lobby, in the elevator machine room or in elevator shafts is activated. Elevator recall shall be indicated on the alpha-numeric display and shall be as follows:

1. Passenger and Freight Elevators shall recall to the First Floor for lobby initiating device alarms on all levels above the First Floor.

2. Passenger and Freight Elevator shall recall to the First Floor for lobby initiating device all alarms below the First Floor.

3. Passenger and Freight Elevator shall alternately recall to the Second Floor for alarms from the first floor lobby initiating device.

4. Activate relay to provide signal to elevator cab that smoke detector in the machine room or elevator shaft is in alarm.

F. Smoke doors on all floors shall be closed by opening of the addressable output relay powering their magnetic hold open devices whenever the smoke detector on either side of the door is activated or the building smoke exhaust system of the floor is activated.

G. Air handling units shall be shutdown via addressable output relay whenever the unit duct smoke detector is activated, on general alarm, or the building smoke exhaust system on the floor served by the unit is activated.

H. Closure of a supervised OS&Y or PIV valve sensed via a supervisory switch or loss of supervisory air pressure in a dry-pipe sprinkler system, sensed via a pressure switch shall cause the following operations and indications:

1. The system supervisory alarm LED on the Fire Alarm Control Panel shall flash. The internal audible trouble device shall sound. Acknowledging the supervisory alarm condition shall silence the audible supervisory device and revert the flashing supervisory alarm LED to a steady state.

2. An alpha-numeric LCD Display shall indicate all applicable information associated with the supervisory condition including: device type, device location, and time of alarm. Location messages shall be custom field-programmed to respective premises.

3. Appropriate status change message(s) shall be transmitted to all graphics

terminals displays monitors, and printers.

I. Fire Pump Controllers shall be monitored by the fire alarm system for fire pump run, fire pump phase reversal, fire pump loss of power, fire pump low pressure and fire pump isolating switch open. The presence of an alarm or trouble condition shall cause the following operations and indications.

1. The system alarm or trouble LED on the Fire Alarm Control Panel shall flash. The internal audible trouble device shall sound. Acknowledging the alarm or trouble condition shall silence the audible trouble device and revert the flashing common alarm or trouble LED to a steady state.
2. An alpha-numeric LCD Display shall indicate all applicable information associated with the alarm or trouble condition including: device type, device location, and time of alarm or trouble. Location messages shall be custom field-programmed to respective premises.
3. Appropriate status change message(s) shall be transmitted to the monitoring locations at Police Dispatch and the UH Fire Alarm Shop.

J. The presence of a ground condition or an open circuit on any alarm initiation circuit or a ground condition, open circuit or short circuit on any alarm indicating circuit, blockage, lens contamination or physical misalignment of any beam type smoke detector, a trouble condition at a fire suppression system panel or other trouble condition shall cause the following actions and indications:

1. The system common trouble LED on the Fire Alarm Control Panel shall flash. The internal audible trouble device shall sound. Acknowledging the trouble condition shall silence the audible trouble device and revert the flashing common trouble LED to a steady state.
2. An alpha-numeric LCD Display shall indicate all applicable information associated with the trouble condition and its location. System trouble diagnostics shall assist in defining the trouble condition. Unacknowledged alarms/messages shall have priority over any trouble displays and take precedence on the LCD annunciator. Trouble conditions will be stored in memory for future recall/ display.
3. Appropriate status change message(s) shall be transmitted to the monitoring locations at Police Dispatch and the UH Fire Alarm Shop.

K. All designated "nonsilenceable" auxiliary control functions shall remain in operation (even upon silencing of audible alarms) until such time as the control panel is cleared and reset manually (i.e. fan control outputs, central station interface, elevator recall interface, etc.).

L. Provisions shall be included within the Fire Alarm Control Panel for the following manual controls in addition to those previously mentioned:

1. Disconnect audible signaling while testing.
2. Temporary software bypass of selected alarm points.
3. Software assignment of selected alarm points to alarm verification function as a method of tracking alarms caused by environmental factors or maintenance requirements. Waterflow switches, smoke detectors, and valve supervisory switches shall be assigned to the verification group to eliminate nuisance alarms.
4. Any zone may be enabled or disabled remotely via the monitoring locations.

2.4 SYSTEM DEVICES:

A. System devices shall be located as shown on the Drawings. The Contractor shall refer to all the drawings to determine where devices are to be located. All system devices shall be numbered with a unique number. The numbering system shall include the building area, type of device, and device number. This numbering system shall be shown on each submitted floor plan drawing, fire alarm riser diagram and be tabulated. The tabulation shall be included in each O&M Manual submitted to the Owner.

2.5 SYSTEM ZONING:

A. The system shall employ "intelligent" heat and smoke detectors and addressable interface devices capable of being recognized and annunciated at the main control panel and monitors on an individual basis. All devices shall be field-programmed into software zones for the purpose of general area identification and annunciation. However, each device shall also be identified on an individual basis including exact location and device type. All device location information shall be totally field-programmable to exact job requirements.

B. Initiating and monitored devices shall include, but not be limited to, the following:
   1. Manual pull stations.
   2. Ceiling smoke detectors.
   3. Duct smoke detectors.
   4. Ceiling heat detectors.
   5. Beam smoke detectors.
   6. Addressable input devices.
   7. Sprinkler flow and pressure switches.
   8. Valve supervisory switches.
   9. Fire suppression system panels.
   10. Fire pump controllers.

C. The system shall utilize remote panels for distributed voice communications. Remote panels shall communicate with the main CPU via the data loop and be capable of being intermixed on the same loop as intelligent heat and smoke detection and control modules.

D. Output devices shall include, but not be limited to, the following:

   1. Ceiling alarm speakers.
   2. Wall and ceiling alarm speakers/visual signals.
   3. Visual alarm devices.
   4. Addressable interface relays.
   5. Magnetic door holders.
   6. Monitoring Locations.

2.6 SYSTEM CONFIGURATION:

A. System equipment shall include, but not be limited to an operator's control/system control panel, remote panels, remote power supplies, monitoring locations, HVAC override, battery backup, alarm indicating devices, door hold opens and output

relays and other devices required to provide a complete and working system.

B. The system control unit shall be connected to remote panels on a looped signaling line circuit. The wiring of the loop shall be so arranged that additional panels may be inserted in the loop without requiring additional wires to be installed between panel and the system control unit. In additional, loops shall be so arranged that any wiring fault on a loop shall not disable more than 250 initiating devices. A single open ground or multiple opens in different wires at the same location shall not prevent receipt of alarm signals from that loop.

C. The system shall be of the active multiplex/addressable type wherein each initiating device shall be repetitively scanned, causing a signal to be transmitted to the control unit that indicates the individual initiating device circuit installation wires are intact. Loss of such a signal at the system control unit shall result in a trouble indication as specified hereinafter for the particular initiating device affected. All initiating devices in the system shall transmit their normal, trouble or actuated status signals in no less than 5 second intervals.

D. Each individual smoke detector shall be of the analog type so that the system can be used to read smoke levels on a real time basis from selected smoke detectors for maintenance and diagnostic purposes. All smoke detectors and other initiating devices shall be individually indicated at the main control panel, the color graphics unit and each DGP, when changing to an alarm or trouble state.

2.7 FIRE ALARM SYSTEM CENTRAL EQUIPMENT:

A. General: The Fire Alarm Control Panel shall be modular in design utilizing distributed solid state microprocessors and be capable of future expansion. The microprocessor-based CPU shall be completely field-programmable. CPU module shall provide for programmable nonvolatile RAM memory utilizing integral lithium-based memory IC chips. Each panel module shall be independent employing its own microprocessor circuitry for reliability and independent operation in case of main CPU failure. The system control unit shall have capacity for the required active detection and output points with space for future use and expansion. The control unit shall be listed to the latest UL 864 Standard. All circuitry shall be UL listed for power-limited application and use positive temperature coefficient devices for current limiting. The panel shall be provided with keylock hinged door to access system controls/switches. The panel door shall be provided with a transparent window for viewing all alarm, trouble indicators, and LCD annunciator. The control unit shall be designed for semi-flush mounting.

B. Central Processing Unit Module (CPU): The CPU shall communicate with, monitor and control all other modules in the panel via internal serial communications techniques.

1. Removal, disconnection, or failure of any control panel module shall be detected and reported by the CPU.

2. The CPU shall contain and execute all custom control-by-event programs for specified events if a fire situation is detected in the system. Such programs shall be held in nonvolatile programmable memory, and shall not be lost even if system primary and secondary power failure occurs.

3. The CPU module shall contain a real-time clock circuit to time/date stamp system events and execute custom time control programs. Time control program events shall be terminated in a fire conditions.

C. Display Interface Board (DIA): The DIA shall provide all touchpad controls and indicators used by the system operator and may also be used to program all control panel and system parameters.

1. The DIA shall contain, and display, custom alphanumeric labels for all intelligent detectors and addressable modules. Such label information shall be stored in field-programmable nonvolatile memory.
2. The DIA shall provide a minimum of an 80 character alphanumeric Liquid Crystal Display (LCD).
3. The DIA shall provide Light-Emitting Diodes (LEDs) for ac power, system alarm, system trouble, display trouble, and disable.
4. The DIA shall provide status readouts, manual control action, and entry of any alphabetic or numeric information. The keypad shall include means to enter passwords to prevent unauthorized manual control or programming.

D. Serial Interface Board (SIB): The SIB shall provide the following interfaces:
1. Two ports for remote printer/CRT devices (RS-232c).
2. Two ports for future local printer (RS-232c).

E. Loop Control Module: Loop Control Module shall be provided to monitor and control multiple loops of addressable initiating and control devices, up to 250 devices per loop. Allow at least 10% spare capacity per loop for future expansion.
1. The Loop Control Module shall communicate and provide power to all devices on its Style 4 loop over a single pair of wires. For dynamic Style 4 supervision the loop may be branch-circuited or "t-tap" connections may be made off of the loop. Loop wiring shall be twisted shielded pair of up to 10,000' in length.
2. The Loop Control Module shall receive digital information from all "intelligent" detectors and shall process this information to determine normal, alarm, trouble and sensitivity conditions. The analog information shall also be used for automatic test and determination of maintenance requirements.
3. The Loop Control Module module shall individually monitor all "intelligent" detectors for analog sensitivity variation initiating a “Near Dirty” and a “Dirty” trouble signal. The system shall adjust alarm sensitivity threshold of the detectors sensitivity, in this case to ensure that false alarms are not created due to dirty detectors, nor reducing the overall alarm threshold.
4. The Loop Control Module shall communicate continuously with each "intelligent" detector and addressable module on its loop and verify its proper function and individual status. Communication with up to 250 such devices per loop.

F. Modular Network Card: The modular network card shall be provided to allow the voice communications system and network information to direct communications through this fire alarm system and future fire alarm systems.

G. Control Switches: Provide the following control switches at the Fire Alarm Control Panel.
1. Acknowledge switch.
2. Signal silence switch.
3. System reset switch.
4. System test switch..

H. Walk Test: The system shall include a special "walk test" mode where each initiating device is manually placed in alarm. The control panel pulses the system audible

devices on detection of each such alarm and automatically resets the panel, permitting a single serviceman to functionally test the entire system.

I. Automatic Detector Test: The system shall include a special automatic detector test features which permits reading and adjustment of the sensitivity of all intelligent detectors from the main control panel. In addition, the automatic test feature shall also permit the functional testing of any "intelligent" detector or addressable interface device individually or by zone from the main control panel. Results of the test are then indicated on the LCD display. A printout of all test data shall be capable via the system printer at either existing monitoring location.

J. Special System Reports: The system shall have the ability to generate and print, upon command, system and point status reports.

1. Selection of "system" read status provides the operator with global system programming information including: alarm verification, SLC loop styles, number of SLC loops, number of software zones, number of auxiliary power supplies, signal silence inhibit.

2. Selection of "point" read status provides the operator with selected individual point programming data including: point status (normal, alarm, trouble, disabled, etc.), address, type I.D., control by event, custom alphanumeric label, verification status, alarm threshold level, sensitivity, silenceable/ nonsilenceable, SLC loop number, and device number.

K. System Diagnostics: The system shall include special software to detect, diagnose, and report failures and isolate such failures to a printed circuit board level.

1. Each module via its resident, independent processor shall periodically perform independent self-test routines as a self-operational/performance test. Any irregularities are reported via the LCD display and trouble indicators.

2. A lamp test function shall be provided to test all system indicators including the LCD display. This function shall also test the panel trouble device for proper operation.

3. A keypad test function shall also be provided allowing the user to interactively confirm that all keys are functional and operating correctly.

4. The system shall include independent "Watch-Dog" timer software to detect and report failure of any microprocessor circuit, memory, or software. The function of this safe-guard software/circuitry is to then restart the respective processor and maintain proper operation of the system. In addition, the master CPU has control over a hardwired reset terminal which can perform a system-wide restart.

L. Field Programming: The system shall be 100% field-programmable or programmable from the monitoring locations.

1. All programs shall be stored in nonvolatile RAM memory, with a dual partition to allow for switching between partitions to avoid necessity for panel being off-line during programming.

2. Programming shall be accomplished only after entering an appropriate and preselected five digit password security code.

3. All programming functions shall be initiated via special system "prompting" menus via the system main CPU. The system shall be capable of direct English language programming and prompting and not require complex digital equations or special formulations.

4. The system shall provide a means to "review" all programmed functions..

5. Any addressable indicating circuit or auxiliary addressable relay shall be programmed to activate on alarm of a single initiating device or a combination of initiating devices.

M. Event History: The main fire alarm panel shall have the resident ability to store a separate alarms for alarm, trouble, and supervisory events in independent history logs.

1. Event history shall include all system alarms, troubles, operator actions (i.e. acknowledge, silence, reset, program entry, etc.), unverified alarms, circuit/point alterations, component failures.

2. Events shall be time and date stamped and be capable of being recorded and/or reviewed without purging the history file.

3. Events shall be stored in non-volatile buffer memory. Access to history buffer shall be secured via five digit password security code.

4. Event recording shall automatically overwrite the oldest event(s) in memory.

N. Power Supply: The power supply for the panel and all fire alarm peripherals shall be integral to the control panel.

1. The power supply shall provide all control panel and peripheral power needs with filtered power as well as 3 amperes of regulated 24 volt dc power for external audio/visual devices. The audio/ visual power may be increased as needed by adding additional modular expansion power supplies.

2. All power supplies shall be designed to meet UL and NFPA requirements for power-limited operation on all external signaling lines, including initiating circuits and indicating circuits.

3. All circuitry shall be UL listed for power-limited application and use positive temperature coefficient devices for current limiting. Fuses or other thermal overload type protection shall be unacceptable.

4. The system shall derive its primary operating power from a 120 volt ac, single phase, 60 Hz supply. There shall also be a 24 volt battery standby power source with internally supervised batteries and automatic charger, capable of operating the entire system for a minimum of 24 hours in the supervisory mode and then be capable of operating the alarm devices for a minimum of 15 minutes.

5. The power supply unit shall contain suitable overvoltage protection to prevent any malfunction or damage which might occur from line power surges (lightning).

6. Upon loss of main power, the power supply unit shall automatically revert to battery power and the system shall remain fully operational.

7. When the ac power is restored, the control unit shall automatically revert to normal operation without requiring any manual restarting procedures.

8. The battery shall be automatically charged by a built-in short-circuit-proof charger.

9. The charging current shall be automatically controlled according to the battery's ambient temperature.

10. After a full discharge, the system shall be able to recharge the batteries completely within 24 hours.

11. The connection to the battery shall be automatically switched off when the voltage drops below 19 volts to protect battery cells from damage to deep discharge.

12. Sealed lead acid batteries shall be used for emergency power source.

13. The entire power supply charger circuits including fuses shall be supervised both positive and negative ground fault supervision, battery/charger fail condition, ac power fail indicators. The power supply shall also provide supervision of modular expansion power supplies as may be required. Any malfunction or blown or missing fuses shall result in a fault indication on the control unit.

2.8 VOICE COMMUNICATION PANEL:

A. General: The voice communications panel shall be modular in design, integral to the main fire alarm control panel, utilizing solid state microprocessor circuitry, and be capable of future expansion. The control panel shall be of dead front construction and have specified communications circuits with space for future use and expansion. The primary voice communications panel shall be located in the Fire Command Center. A labeled switch shall be provided in the voice communications panel in the Fire Command Center which shall take direct control of the paging system to the Fire Command Center. A labeled LED indicator shall be provided in each voice communications panel to indicate its' operational status.

B. Communications Controls: The communications control panel shall incorporate the following controls and indicators:

1. All call select switch with LED indicator.

2. General alarm select switch with LED indicator.

3. Audio trouble LED indicator.

4. Manual tone/message select switches with LED indicators.

5. Communications pilot/status LED indicator.

6. Communication zone select switches with LED select indicators.

7. Communications monitor speaker with volume control.

8. Dynamic paging microphone.

C. Paging:

1. The microprocessor based one way paging system shall be provided with a means to selectively and simultaneously activate voice, tones or digitized messages to any or all zones in the system via electronic membrane touchpad controls. In addition, visual indication by zone will be provided for zones selected.

2. Each audio/speaker circuit will be totally supervised for opens, shorts or grounds with direct shorts prohibiting selection of the respective zone.

3. All audio circuits shall be power limited per the latest UL and NEC Standards.

4. All speaker circuits shall be wired in parallel.

5. Each speaker zone shall be provided with an amber trouble LED for circuit

trouble conditions and an active/on LED indicator.

6. Alarm/Paging zones shall be provided: for each building level.

D. Communication Electronics:

1. The voice communications center shall be a microprocessor based, supervised, multi-function, audio generator. The communications generator shall contain:
   a. Voice communications CPU.
   b. Nonvolatile RAM memory.
   c. Communications configuration dip switches.
   d. Two custom digitized message circuits.
   e. Up to four selectable tone generator/oscillators.
2. Each sub-circuit of the communications center shall be fully supervised and failure of any tone oscillator or digital message generator shall revert the system to the default standby generator. Any system/sub-system failure shall be indicated audibly and visually by a system trouble condition.
3. The system shall have the ability to provide any combination of standard digitized factory programmed messages, custom field programmable digitized messages, and/or alarm tones. Capability for multiple messages shall be standard with messages capable of being selected manually and/or via control-by-event program. Custom message programming shall be capable of being performed at the main fire alarm communications panel and without the need of special programming/recording apparatus or off site programming. Mechanical tape decks/drives shall not be deemed acceptable.

E. Amplifiers:

1. The system shall provide distributed amplification via the system remote panels. The system shall be capable of amplifier expansion capacity as required.
2. Each amplifier shall be continuously monitored electronically for proper output level. Each amplifier shall be capable of being properly adjusted for correct output level.
3. Each unit shall be equipped with NORMAL level LED and ABNORMAL level LED diagnostic indicators.
4. Each amplifier shall provide 100 watts of 75 VRMS power and be capable of being assigned to one or more audible circuits.
5. Each unit shall be equipped with its own individual power/pilot LED, audio input trouble LED, battery input trouble LED, and amplifier trouble/fail LED. Any fault or trouble condition shall be annunciated audibly and visually via a system trouble condition.
6. The system shall provide automatic standby amplification for any amplifier in the system, with one spare amplifier per panel. Transfer from any faulty amplifier to the standby unit shall be fully automatic.

F. Alarm Tone: The fire alarm alert tone shall be a slow whoop tone with standby default tone in the event the primary oscillator fails. Transfer to default tone oscillator shall be automatic upon primary oscillator failure. Transfer to default tone shall also be automatic upon failure of any digitized voice message.

2.9 FIREFIGHTER'S TELEPHONE SYSTEM:

A. Shall not be required by University of Houston Fire Marshall (AHJ).

2.10 FIREFIGHTERS' HVAC OVERRIDE

A. The emergency communications panel shall provide complete firefighters' manual control override and status for building smoke control systems and be integral to the main fire alarm control panel.

B. Each auxiliary function shall be capable of being activated or deactivated manually by selection of the respective circuit via the electronic touchpad controls. The system shall provide ability to shutdown or start designated emergency fans and have the ability to override and reverse any automatic start/ shutdown function. Each firefighters auxiliary control circuit shall be supervised.

C. Each controlled fan and system shall incorporate a supervised "confirmed status" LED indicator. Status indicator shall be annunciated when the fan or system is in the "on mode".

D. All necessary interfaces between the fire alarm/communications system and firefighters' override controls shall be provided herein as required. The firefighters' override controls shall be completely interfaced with the building Control and Automation System. The firefighters' override system shall be wired as a low voltage 24 volt dc system.

E. Firefighters' HVAC override controls and confirmed status indicators shall be as follows:

1. Status indicators for each of the two stairwell pressurization fans. Status indication shall be from a dry contact in the fan starter.

2. On/Off/Auto control by unit for the outside air handling unit and each of the exhaust fans. Status indication shall be from a dry contact in the air handling unit starter.

3. Off/Auto control unlock all electrically secured doors. Status indication shall be provided from system software.

4. Close/Auto control to close all held open doors and fire/smoke shutters. Status indication shall be provided from system software.

2.11 Monitoring Locations:

A. System shall be annunciated and controlled at the two existing locations. Fire Alarm graphics will not be required per University of Houston Standards.

2.12 CATHODE RAY TUBE (CRT) DISPLAY/KEYBOARDS:

A. Will not be required.

2.13 PRINTERS:

A. Will not be required.

2.16 REMOTE ANNUNCIATORS:

A. Will not be required, except where shown on plans. Main fire panel will serve as the building primary annunciator.

B. Graphic Annunciator:

1. Will not be required.

2.15 SMOKE AND HEAT SENSORS/DETECTORS

A. Intelligent "Ceiling-mounted" Photoelectric Smoke Sensors: Analog photoelectric smoke sensors shall be provided where indicated on the Drawings.

1. The intelligent photoelectric smoke sensors shall connect via two wires to one of the intelligent control panel loops.

2. The sensors shall use the photoelectric principal to measure smoke density and shall, on command from the control panel, send data to the panel representing the analog level of smoke density.

3. The sensor shall also provide a "Near Dirty" and “Dirty” feature whereby the detector shall initiate a trouble condition should the units sensitivity approach the outside limits of the normal sensitivity window.

4. The sensor shall be provided with extensive RF and EMF noise reduction circuitry.

5. The sensor shall employ sophisticated self-compensating solid state LED light source and photosensitive circuitry.

6. The sensor/control panel shall provide a calibrated test method whereby they will simulate an alarm condition and report that condition to the control panel. Such a test may be initiated at the detector itself-activated remotely on command from the control panel.

7. The sensors shall provide address-setting means the sensors shall also store an internal identification code which the control panel shall use to identify the type of sensor.

8. The sensors shall provide an alarm and power/status LED. Status LED shall flash under normal conditions, indicating that the sensor is operational regular communication with the control panel. The LED may and in regular communication with the control panel. The LED may be placed into steady illumination by the control panel, indicating that an alarm condition has been detected and verified. The detector shall be capable of allowing an output connection shall be provided in the base for connecting an external remote alarm LED.

9. The sensor shall be flush ceiling-mounted and be provided with modular detector head with twist-lock base. Sensors shall also be suitable for surface-mounting below the raised floor or above the ceiling. Sensors shall be provided in smooth attractive white finish, and sealed against dirt, vermin, and back pressure. Sensors shall be provided with fine mesh insect/contaminate screen.

10. Sensors shall be UL listed with respective control panel.

11. Devices shall not be required in restrooms, individual offices, or shower rooms.

12. Devices located in corridors shall be spaced no more than 30 feet apart.

B. Intelligent "Duct Mounted" Photoelectric Smoke Sensors: Duct-mounted intelligent photoelectric smoke sensor shall be provided where shown on the Drawings.

1. Sensors shall operate on the same principles and exhibit the same basic characteristics as area type "intelligent" smoke sensors. The unit shall be capable of interchanging/accepting either photoelectronic or ionization type

sensors.

2. The sensor shall operate in air velocities of 300 FPM to 4,000 FPM without adverse effects in detector sensitivity.

3. Each sensor shall operate directly with the intelligent control panel loop, without an interface module.

4. The unit shall consist of a molded plastic enclosure with molded integral conduit knock-outs. The unit shall be provided with clear faceplate cover to provide visual viewing of detector/sensor for monitoring sensor operation and chamber condition. The duct housing shall be provided with gasket seals to provide proper sealing of housing to mechanical ductwork and to ensure proper air flow into the detector sampling chamber. Duct housing shall be designed to easily mount to rectangular or round ducts. Where duct detectors are mounted in a location not easily accessed, provide a remote alarm test switch and LED in an accessible location.

5. The duct sensor unit shall be UL listed to the most current UL 268A standard and be cross-listed for use with the fire alarm control panel.

6. Each duct sensor unit shall be equipped with sampling tubes protruding into the associated ductwork. Sampling tubes shall extend the width of the duct. Sampling tubes shall be provided with integral porosity filter system to aid in reducing detector contamination. Sensors shall be installed per NFPA 90A.

7. Each sampling tube will be supported on both ends.

C. Intelligent Ceiling Mounted Heat Sensors: Analog thermal sensors shall be provided where indicated on the Drawings.

1. The intelligent thermal sensors shall connect via two wires to one of the intelligent control panel loops.

2. The sensors shall use dual electronic thermostats to measure temperature levels in its chamber and shall, on command from the control panel, send data to the panel representing the analog temperature level.

3. The sensors/control panel shall provide a test method whereby they will simulate an alarm condition and report that condition to the control panel. Such a test may be initiated at the sensor itself or may be activated remotely on command from the control panel.

4. The sensors shall provide address-setting means. The sensors shall also store an internal identification code which the control panel shall use to identify the type of detector.

5. The sensors shall provide am alarm and power/status LED. Status LEDs shall flash under normal conditions, indicating that the sensor is operational and in regular communication with the control panel. The LED may be placed into steady illumination by the control panel, indicating that an alarm condition has been detected. The detector shall be capable of allowing an output connection shall be provided in the base for connecting an external remote alarm LED.

6. The sensor shall be semi-flush ceiling-mounted and be provided with modular detector head with twist-lock base. Sensors shall be provided in smooth white finish.

D. Optical beam smoke detectors and an addressable input device shall be provided where indicated on the Drawings.

1. Detectors shall consist of a control unit, an infra-red transmitter unit and an

infra-red receiver unit. Detector shall be powered at 24 VDC from the fire alarm system.

2. Detector shall have a self-check and automatic compensation circuit to compensate for dust accumulation, component aging and temperature change.

3. Detectors shall be installed to project a beam approximately 1 foot below the ceiling in the projected area and shall alarm when smoke in the beam path reduces the signal strength to between 40 and 93 percent for period of 5 seconds.

4. The detector shall remain in an alarm condition until reset.

2.16 MANUAL STATIONS:

A. Addressable Manual Stations: Flush mounted dual action manual stations with an addressable interface module or approved equal shall be provided where indicated on the drawing the Drawings.

1. Manual stations shall be an alternate color to the wall color they are installed on, for easy identification.

2. The manual station addressable module shall connect with two wires to one of the intelligent control panel loops.

3. The module at the manual station shall, on command from the control panel, send data to the panel representing the state of the manual station switch.

4. The manual station addressable module shall provide address-setting means.

5. All pull stations will require a UL and ADA listed pull station cover with integral piezo alarm.

2.17 INPUT/OUTPUT DEVICES:

A. Monitor Module (Addressable input Device): Addressable monitor modules shall be provided where required to interface to contact alarm devices.

1. The monitor module shall be used to connect a supervised zone of conventional initiating devices (any N.O. dry contact device, including 4 wire smoke detectors) to an intelligent loop.

2. The monitor module will mount in a 4" square electrical box.

3. The monitor module shall provide address-setting means using a binary DIP switch.

B. Control Module (Addressable Output Device): Control/relay modules shall be provided where required to provide audible alarm interface and/or relay control interface.

1. The control module shall be used to connect a supervised zone of conventional indicating devices (any 24 volt polarized audiovisual indicating appliance) to an intelligent loop. The zone may be wired Class A or Class B field-selected. The control module may be optionally-wired as dry contact (Form C) relay.

2. The control module will mount in a standard 4" electrical box.

3. Power for the relay actuation shall be provided by the intelligent detector loop

to reduce wiring connection requirements. Audio/visual power shall be provided by a separate loop from the main control panel or from supervised remote power supplies.

4. The control module shall provide address-setting means

C. Auxiliary Control Relays: Relays shall be provided for control interface. Relays shall be heavy duty type and rated up to 20 amps at 120 volts ac, 60 Hz. Relays shall be provided with NEMA 1 dust cover assembly and be provided with DPDT contacts.

D. Sprinkler Water Flow and Pressure Switches: Switches shall be furnished and installed under Division 15, with wiring and addressable input device interface by this Contractor.

E. Fire Protection OS&Y Valve Supervisory Switches: Switches shall be furnished and installed under Division 15, with wiring and addressable input device interface by this Contractor. Switches shall activate a supervisory signal within two turns of the valve or more than 1/3 of the valve travel toward the closed position.

F. Fire Suppression System Panel shall be a networked fire alarm control panel that will reside on the existing fire alarm network and share point information and control with the monitoring locations and any panel on network.

G. Fire Pump Controllers: Dry alarm and trouble output contacts shall be provided in the Fire Pump Controllers furnished and installed under Division 15, with wiring and addressable input device interface by this Contractor.

H. Elevator Recall: Addressable fire alarm system dry output contacts installed by this Contractor shall provide a recall signal to the elevators furnished and installed under Division 14.

I. Security/Access Control Interface: Addressable fire alarm system dry output contacts installed by this Contractor shall provide an unlock signal to the Security/Access Control system furnished and installed under Division 11.

J. Magnetic Door Holders: Low profile 24 volt wall or floor mounted electromagnetic door hold opens as required to suit installation requirements. Magnetic door hold opens shall be powered from the fire alarm system.

K. Fire/Smoke Shutter Interface: Addressable fire alarm system N.C. dry output contacts installed by this contractor shall provide a hold open signal to fire/smoke shutters and release controls provided under another Division.

L. Fire Command Center Electric Strikes: Addressable fire alarm system N.C. dry output contacts installed by this contractor shall provide a hold locked signal to electric strikes provided under another Division.

M. Smoke Control/HVAC Interface: Addressable fire alarm system dry output contacts installed by this Contractor shall provide equipment positive start and stop signals for Firefighters' Override, stop signals for equipment shutdown and start signals for smoke control made initiation and equipment start up to the Building Control and Automation System furnished and installed under Division 15, as applicable. Addressable control relays and inputs shall be located within 2 feet of the controlled/monitored device.

2.18 ALARM SIGNAL DEVICES:

A. Ceiling Mounted Fire Alarm Speakers in Finished Areas: Flush mounted fire alarm speakers shall be provided.

1. Speakers shall be listed under UL Standard 1480, meet all specifications of the Life Safety Code and be capable of reproducing both tone alerts and voice communication instructions. Speakers shall have built in matching

transformer, field selectable multiple power taps and circuitry for speaker/line supervision. Speakers shall be provided with screw terminal connection points.

2. Speakers shall have a textured white decorative grill.
Speakers shall be tapped to produce a minimum sound-pressure level of 87 dBA at 10'.

3. Speakers shall be ceiling mounted and located as required and as located on the drawings.

B. Ceiling Mounted Fire Alarm Speakers/Visual Signals in Finished Areas: Flush mounted fire alarm speakers with integral visual alarm signals or equal shall be provided.

1. Speakers shall be listed under UL Standard 1480, meet all specifications of the Life Safety Code and be capable of reproducing both tone alerts and voice communication instructions. Speakers shall have built in matching transformer, field selectable multiple power taps and circuitry for speaker/line supervision. Speakers shall be provided with screw terminal connection points.

2. Speakers shall have a textured white decorative grill.
Speakers shall be tapped to produce a minimum sound-pressure level of 87 dBA at 10'.

3. Speakers shall be ceiling mounted and located as required by code, and as located on the drawings.

4. Visual alarm signals shall be integral with audible alarm device where shown on the drawings. Strobe lettering shall be oriented with lettering properly oriented with letters vertical, with strobe unit installed. The word “ALERT” shall be used instead of “FIRE.”

5. Visual units shall be of the electronic flashing xenon strobe type and operate on 24 volts dc. Lights shall operate in unison with audible alarm signals and continue flashing upon silencing of alarm signals.

6. Visual shall be synchronized.

C. Wall Mounted Fire Alarm Speakers/Visual Signals in Unfinished Areas: Recess/surface mounted fire alarm speakers with integral visual signals or equal shall be provided.

1. Speakers shall be listed under UL Standard 1480, meet all specifications of the Life Safety Code and be capable of reproducing both tone alerts and voice communication instructions. Speakers shall have built in matching transformer, field selectable multiple power taps and circuitry for speaker/line supervision. Speakers shall be provided with screw terminal connection points.

2. Speakers shall have a textured white decorative grill. Speakers shall be tapped to produce a minimum sound-pressure level of 87 dBA at 10'.

3. Speakers shall be wall mounted and located as required by code and as located on the Drawings.

4. Visual alarm signals shall be integral with audible alarm device where shown on the Drawings. Strobe lettering shall be oriented with lettering properly oriented with letters vertical, with strobe unit installed. The word “ALERT” shall be used instead of “FIRE.”5. Visual units shall be of the electronic flashing xenon strobe type and operate on 24 volts dc. Lights shall operate in unison with audible alarm signals and continue flashing upon silencing of alarm signals.

6. Visual shall be synchronized.

2.19 FIRE ALARM POWER BOOSTERS:

A. Provide power boosters as required. Power to be provided from emergency panel located on each floor in mechanical or electrical rooms.

2.20 SYSTEM WIRING:

A. The equipment supplier shall furnish to the installing contractor a complete detailed point-to-point wiring diagram showing the system equipment and required number, type and sizes of conductors and conduit sizes. Where common devices which break the alarm circuit are installed on a common zone with shorting type device, the circuit breaking devices shall be wired electrically downstream of the shorting type devices.

B. All fire alarm system wiring shall be multi-conductor, UL listed FPL for limited energy (300 volt) and fire alarm applications, and NEC approved fire alarm cable. Wiring shall be installed in accordance with NEC, local codes, Article 760 of NFPA Standard 70, and manufacturer's recommendations. All wiring shall be copper and installed in conduit sized in accordance with the National Electrical Codes.

C. Fire alarm system wiring shall be color coded.

D. All fire alarm system junction boxes including covers, shall be secured, painted red and marked in contrasting lettering.

E. Wire size shall be determined by calculated voltage drop and circuit loading. Minimum wire size shall be as follows:

1. #18 AWG for initiating and low voltage auxiliary control circuits.
2. #16 AWG for alarm circuits.
3. #14 AWG for all power circuits.

PART 3 - EXECUTION

3.1 INSPECTION:

A. Installer shall examine the areas and conditions under which the fire alarm system is to be installed and notify the Contractor in writing of conditions detrimental to the proper and timely completion of the work. Do not proceed until unsatisfactory conditions have been corrected.

3.2 SYSTEM DESIGN:

A. General: The basic equipment and device locations have been shown on the contract drawings. Specific wiring between equipment/devices has not been shown. It is the contractor's responsibility to submit for approval the COMPLETE ENGINEERED system configuration and layout showing all devices, wiring, conduit, and locations along with other required information as specified herein.

3.3 PROGRAMMING:

A. General: The manufacturer shall provide and install a menu driven software package, and shall provide all required programming of the system, including digitized voice alarms, graphics and action messages. Map and report formatting will be part of the software package. The software programming shall provide clear decision-making displays and text during critical alarm conditions that will allow the operator to make simple decisions during a crisis.

B. Review: Before the manufacturer loads the program the Owner shall be given the

opportunity to review and approve all textural displays, messages and system sequences.

3.4 INSTALLATION:

A. General: Install system and materials in accordance with manufacturer's instructions, roughing-in drawings, and details on the Drawings. Install electrical work and use electrical products complying with the requirements of the applicable Division 16 sections of these Specifications. Mount manual stations and alarm devices at heights specified in NFPA 72.

B. Wiring: All wiring shall be in accordance with NFPA 72, the National Electrical Code, Local Codes, and Article 760 of NFPA Standard 70. All wiring sizes shall conform to recommendations of the equipment manufacturer, and as indicated on the engineered shop drawings.

1. Install fire alarm system line voltage and low-voltage wiring in a suitable raceway. Conceal fire alarm system wiring in conduit in mechanical rooms and areas where other conduit and piping are exposed. Fasten flexible conductors, which bridge cabinets and doors, neatly along hinge side and protect against abrasion. Tie and support the conductors neatly.

2. All wiring shall be run in a supervised fashion (i.e. no branch wiring or dog-legged wiring) per NFPA requirements such that any wiring disarrangement will initiate the appropriate trouble signals via the main control panel per NFPA and UL requirements. Intelligent SLC loops may be T-tapped/branch wired due to inherent dynamic supervision.

3. Wiring splices shall be kept to a minimum with required splices to be made in designated terminal boxes or at field device junction boxes. Transposing or color code changes of wiring will not be permitted. End-of-line supervisory devices shall be installed with the last device on the respective circuit. Said device shall be appropriately marked designating it as the terminating device on the respective circuit.

4. No AC wiring or any other wiring shall be run in the same conduit as fire alarm wiring.

5. Number code and color code conductors appropriately and permanently for future identification and servicing of the system.

C. Conduit/Raceway: All wire shall not be required to be installed in an approved conduit/raceway system (except where excluded by NEC and the local authority having jurisdiction). Maximum conduit "fill" shall not exceed 40% per NEC.

1. Conduit and raceway system shall be installed, where required, as specified other Sections of the Specifications.

2. Minimum conduit size shall be 3/4" EMT. Install conduit per engineered shop drawings.

3. All vertical wiring and all main trunk/riser wiring shall be installed in a complete raceway/ conduit system. All riser boxes shall be adequately sized for the number of conductors traversing the respective box as well as the number of terminations required. All vertical risers shall be installed in 2 hour rated chases.

D. Labeling: All system controls, indicators and other devices shall be labeled with names, designations and operating instructions as applicable. Labels shall be either engraved nameplates or covered printed labels and shall be approved by the Engineer. All water flow switches which are hidden shall have identification points.

These identification points shall be red tags with white lettering indicating location of the water flow switch. Tag location will be visible from corridors.

E. Checkout: Check wiring to ensure that wiring is in accordance with the system manufacturer's wiring diagrams and that the system is free of open circuits, short circuits, and grounds.

F. Identification: Refer to for additional requirements concerning painting, nameplates, and labeling.

3.5 COORDINATION:

A. It shall be the responsibility of the installing contractor to coordinate all requirements surrounding installation of the fire alarm system with all trades. Adequate coordination shall be provided to ensure proper installation and interface to all peripheral items required to interact with the fire alarm to provide a complete and functional life safety system.

B. The installing contractor shall be fully responsible for coordinating all system and device messages and system operation with the Owner's Representatives and Operating Personnel.

3.6 SYSTEM CHECKOUT AND TEST:

A. All final control panel connections shall be made by a state licensed, factory-trained technical representative of the manufacturer and who shall supervise a System Checkout and Test to demonstrate and confirm to the Engineer, and Owner's Representative that the fire alarm system is 100% operational upon completion of the installation, and that it complies with all local code requirements and these specifications. It is intended that the System Checkout and Test be followed by a continuing program of inspection testing and maintenance. The Contractor shall provide a proposal to the Owner for a Maintenance, Inspection and Quarterly Testing Contract in compliance with NFPA 72, upon completion and system checkout.

B. The System Checkout and Test shall be performed within 30 days after the fire alarm installation and all peripheral systems are completed. The System Checkout and Test shall be performed by a minimum of two licensed fire alarm system technicians, one of which is licensed by the State of Texas, and acceptable to the Engineer and the authority having jurisdiction. The test shall be performed in two parts and two-way radios for use by the test observers shall be provided. The first part shall be a full dry-run test with all subcontractors present, but without the Owner's Representative or fire department present. After the dry-run test is successfully completed, then the final test with the Owner's Representative present shall be performed.

C. This Contractor shall coordinate the test schedule with all necessary parties and subcontractors required to be present for a complete and functional test.

D. The System Checkout and Test which is a comprehensive 100% inspection and test of all fire alarm system equipment and shall include, but not be limited to the following:

1. Fire Alarm Control Equipment:
    a. A visual and functional test of all fire alarm control and auxiliary control equipment.
    b. A visual inspection shall be conducted to establish that all electrical connections and equipment as required are properly installed and operating.
    c. A remote functional fault simulation test shall be conducted on all

relevant field wiring terminations to ensure that all wiring is properly supervised as required.

d. All indicators shall be tested to ensure proper function and operation.

e. All device messages shall be verified to be correct, as installed.

f. All system auxiliary functions including, but not limited to, CPU reporting, elevator recall, fire/ smoke door and shutter control, security interface, HVAC equipment control and shutdown, smoke control initiation, and other specified control functions shall be functionally tested to verify proper operation and proper system messages.

g. Control panel supervisory and alarm current readings shall be taken to verify that the control panel has the appropriate power supplies and standby batteries to operate the system as required. A 3 minute general alarm stress test both under ac power and standby power shall be conducted to further ensure complete operation of the system.

h. The Voice Communication System shall be visually and functionally tested to verify proper operation. Voice paging zoning shall be verified and automatic and manual operation of the voice paging system shall be fully verified. Self-monitoring functions of the voice paging system shall be verified.

i. An intelligibility test shall be conducted with the ADS (acoustically distinguishable space) designated by the AHJ.

j. The firefighters' HVAC system override panel shall be 100% functionally tested to verify that all control switches and indicators function as specified.

2. Fire Alarm Peripheral Devices: All fire alarm peripheral devices shall be functionally tested and the location and testing information recorded for each device.

3. Initiating Devices (Manual and Automatic):

   a. All manual and automatic initiating devices shall be inspected to ensure proper placement and mounting as recommended by the manufacturer and as indicated in these specifications.

   b. All manual fire alarm stations and all automatic initiating devices (smoke detectors, heat detectors, water flow switches, etc.) shall be functionally tested for alarm operation.

   c. A minimum of 10% of initiating devices shall be functionally tested for proper wiring supervision. Failure of any tested device on any zone shall require that all devices in that zone shall be tested for supervision.

   d. All device messages shall be verified to be correct as installed.

4. Alarm Signaling Devices:

   a. All visual alarm indicators and exit sign flashing shall be functionally tested to ensure proper operation and that they are clearly visible.

   b. Alarm signaling devices shall be field-checked and tested for proper operation and output.

   c. Decibel reading shall be taken to ensure that the alarm signal level can be clearly heard in all areas of the facility, if required by the authority having jurisdiction. Additional devices may be required to provide adequate sound penetration (or as required by the local authority having jurisdiction). Contractor shall provide a unit price for such devices should they be required.

   d. An intelligibility test shall be conducted to ensure the alarm message can

be clearly heard in all areas of the facility. The ADS (acoustically distinguishable space) shall be designated by the authority having jurisdiction.

e. A minimum of 10% of the alarm signaling device shall be functionally tested for proper wiring supervision.

5. Reporting:

a. Upon completion of the 100% System Checkout and Test, four copies of the final report shall be documented, certified, and sent to the Engineer for distribution to the Owner or authorized Owner's Representative indicating that all fire alarm equipment has been tested and is 100% operational.

b. The final report shall be generated by the equipment manufacturers headquarters or authorized representative to ensure integrity and uniformity of all testing procedures and reporting. The report shall contain the testing information, stating the precise location and operational status of each and every peripheral device and shall include a Fire Alarm System Certification and Description Document per NFPA 72.

c. The 100% System Checkout and Test shall be performed by factory-trained representatives, and one of the individuals shall possess a state license for fire alarm installation supervision.

d. Upon satisfactory system checkout, the fire alarm system shall be labeled with the appropriate State of Texas fire alarm labels.

3.7 TRAINING:

A. Upon completion of the installation, the equipment manufacturer shall furnish his services for a period of 8 hours of demonstration and training in the use of the system and its connected equipment. The 8 hour training period shall consist of operations and trouble shooting and technical trouble shooting of the fire alarm panel and system. All training shall be provided at the site.

3.8 AS-BUILT/RECORD DRAWINGS:

A. Two sets of manuals and as-built drawings shall be provided by the Contractor. The as-built drawings shall include a reproducible drawing and two copies of each as-built drawing. The drawings and manuals shall be used in the training sessions. At this time, manuals describing the system equipment, as-built wiring diagrams, system keys, and certification of a 100% system audit will be delivered to the Owner. Record drawings shall include, but not be limited to:

1. As-built wiring and conduit layout diagrams incorporating wire color code and/or label numbers and showing all interconnections in the system.

2. Actual locations of each input and output circuit termination, the identification marking of each circuit and the address of each device. Provide an input/output assignment chart. A unique identification number shall be assigned to each alarm initiating device. Identification should be by zone number permanently mounted adjacent to the device or its mounting base. Markings with felt tip pens will not be acceptable.

3. As-built schematic wiring diagrams of all control panels, modules, annunciators and communications panels.

4. As-built heat and smoke detector location drawings showing location dimension of each detector and alarm box.

5. Copies of the manufacturers technical literature on all major parts of the

system including detectors, manual stations, signaling appliances, alarm panels. communication panels and equipment and power supplies.

6. Completed Fire Alarm System Certification and Description Document.

B. Refer to Section for additional As-Built/Record Drawings requirements.

3.9 OPERATING AND MAINTENANCE DATA:

A. The manufacturer's authorized representative shall instruct the Owner's designated employees in the proper operation of the system and all required periodic maintenance. This instruction will include three copies of a written summary in booklet or binder form so employees can retain for future reference. Basic operating instructions for the system shall be framed and mounted at the main control unit. Refer to section 26 00 01 for additional requirements.

3.10 WARRANTY:

A. The fire alarm and security systems shall be warranted against defects in workmanship and materials, under normal use and service, for a period of 2 years from the date of acceptance by the Owner. Any equipment shown to be defective shall be repaired, replaced or adjusted free of charge.

B. The warranty period shall begin after successful completion of the Owner's inspections and tests. In the event of any system malfunctions or nuisance alarms, the Contractor will take appropriate corrective action. This action may necessitate a repeat of the response test if the Owner so desires. Continued improper performance during warranty shall be cause to require the Contractor to remove the system.

C. The warranty start date will not begin until after a period of 30 consecutive days of system operation without any nuisance alarms caused by malfunctioning of hardware of software.

END OF SECTION 28 31 00