

SECTION 28 10 00

ACCESS CONTROL SYSTEM

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section and associated TY-Drawings identifies the Requirements, Technical Design, and Specifications for the Access Control System for the District Wide Upgrades, located in Pflugerville ISD, ("Owner").
- B. The Access Control System (ACS), as specified, is an industry-standard access control system and includes an access control server, access control software, control panels, sub-controller panels, card readers, credentials, door position sensors, request to exit devices, cabling power supplies, and any associated software, hardware or licensing as specified.

1.2 QUALITY ASSURANCE

- A. Contractor Qualifications
 - 1. The Contractor shall possess all relevant Manufacturer Certifications for both the company and individual technicians prior to submitting a bid for the work.
 - 2. The Contractor shall have been in business for a minimum of five (5) years.
 - 3. The Contractor shall have a local office with local technicians and an adequate workforce to complete this project within a one-hundred-mile radius of the project site.
 - 4. The Contractor shall have completed a minimum of five (5) projects similar in size and scope to the Owner's installation, where the systems have been in continuous satisfactory operation for at least one (1) year.
 - 5. Subcontractors shall be identified at the time of bid and comply with the requirements and intentions of these specifications, associated drawings, and related contract documents.
- B. Personnel Qualifications
 - 1. Project Manager/Quality Control Manager - At all times during the progress of the Work, Contractor (or Subcontractor) responsible for the Work of this Section shall assign a competent full-time employee (who shall be available for all on-site coordination meetings).
- C. The Contractor shall possess all relevant Manufacturer Certifications (i.e. access control systems, hardware installation, software installation and programming) for both the company and individual technicians prior to submitting a bid for the work.

1.3 SUBMITTALS

- A. Pre-Bid
 - 1. Refer to Division 28 00 10 for all specification deviation requests.
 - 2. Submit Contractor and Personnel Qualifications documentation indicating that the requirements of the Quality Assurance paragraph of this Section and Section 28 00 10 are met.
- B. Bid
 - 1. Unit Pricing
 - a. Provide unit cost to add/delete a single card reader location; inclusive of all cabling, equipment, labor, licensing, and miscellaneous associated costs.
 - 2. Contractor and Personnel Qualifications

- a. Submit Contractor and Personnel Qualifications documentation indicating that the requirements of the Quality Assurance paragraph of this Section are met. Indicate quantity of full-time local technicians within one-hundred-mile radius of Project Site.
- b. Also include list of three Contractor-installed projects of a similar size and scope that have been in operation for at least one year. Provide the following information for each project:
 - 1) Project Name and Location
 - 2) Project Start and Completion Dates
 - 3) Project Start and Completion Costs
 - 4) Brief Description of Project
 - 5) Client Point of Contact Name and Phone Number

C. Pre-Construction

1. Pre-Construction Submittal for this Section shall include the following:
 - a. Contractor Qualifications
 - 1) Certifications for Project Manager and all technicians expected to work on the Project.
 - 2) Documentation Contractor has been in business for at least five years.
 - 3) Address of Contractor's local office within one-hundred-mile radius of Project Site.
 - 4) Subcontractors – list sub-contractors performing any Work specified in this Section. List shall clearly identify the sub-contractor's legal name and address, the scope of work to be performed by the sub-contractor and the overall percentage of the Work being provided by the subcontractor. If there are no sub-contractors performing any Work, submit statement on company letterhead clearly indicating no sub-contractors will be performing any Work specified in this Section.
 - b. Bill-of-Materials
 - c. Product Data
 - d. Shop Drawings to include:
 - 1) Device Locations
 - 2) Cable Type and Pathways
 - 3) Panel Termination Schedule
 - 4) Elevation Drawings to illustrate the associated devices and the heights at which they will be installed.
 - 5) Naming Convention Information

1.4 SUBMITTAL REQUIREMENTS

A. Pre-Installation Submittal

1. Contractor shall not order, purchase, or install any equipment until pre-installation submittals have been accepted in writing by the Consultant.
2. The Contractor is responsible for notifying and obtaining written approval via RFI from the Consultant/Owner of any proprietary devices, software, and/or installation processes.
3. Contractor is responsible for obtaining permitting as required in accordance with the authority having jurisdiction (AHJ), local, city, state, federal, and/or applicable law requirements. Including but not limited to:
 - a. A floor plan showing the location of the proposed locks.
 - b. The project name, address and associated building permit numbers, all posted on the floor plan.
 - c. The equipment installer name, business address and contact telephone number, all posted on the floor plan.

1.5 PROJECT CLOSEOUT

A. Preliminary Project Closeout submittal:

1. Submit the following a minimum of two weeks before Substantial Completion:
 - a. Memo/letter indicating that the Access Control Work is nearing completion and ready for the Final Site Observation by the Design Consultant.

- b. Approved Shop Drawings or field Drawings with actual reader locations, cable pathways and labels, and head-end locations. BIM/CAD-produced drawings converted to PDF format. Provide 30"x42" laminated shop drawings, for each telecom room serving a given area.
- B. Final Project Closeout submittal for this Section shall include the following:
 - 1. Bill-of-Materials / Product Index – include column indicating any materials or equipment with a manufacturer's warranty longer than one year.
 - 2. Product Data
 - 3. Operation and Maintenance Data
 - 4. Warranty Documentation
 - a. For any materials or equipment provided by the Contractor with a manufacturer's warranty longer than one year, include manufacturer documentation.
 - 5. Record Drawings ("As-Built")

1.6 COORDINATION

- A. Preinstallation Meeting / Coordination with Owner
 - 1. After Bid and before Pre-Construction Submittals, request a Preinstallation Meeting with General Contractor, Design Consultant, and Owner regarding Work specified in this Section.
 - a. This meeting is meant to:
 - 1) Review Scope of work, schedule, and escalation procedures.
 - 2) Establish Owner's preferences and expectations and provide direction for items noted as "Coordinate with Owner."
 - 3) Provide a Work schedule, including key commissioning dates for programming, as required for system operation.
 - 2. Contractor shall document the meeting and send Meeting Minutes to Owner and Design Consultant for sign-off.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS

- A. Unless otherwise stated, all software and licensing shall be for the most current, up to date version of the system provided.
- B. Consultant will have final determination of acceptability of all proposed equipment and must approve submitted equipment prior to purchase or installation.
- C. In the event a manufacturer's specified product or part number has changed or is no longer available, Contractor shall submit a formal RFI for an appropriate substitute.
- D. For listed products with no part number specified, Contractor shall provide a product that meets the performance requirements of these specifications, industry standard practices, and intended application.
- E. Labels on all cabling, materials, and equipment must indicate a nationally recognized testing laboratory.
- F. Original Equipment Manufacturer (OEM) documentation must be provided to the Consultant which certifies performance characteristics and compliance with ANSI/TIA/EIA 568 Standards, where applicable.
- G. Contractor shall review all products specified and required for this project to determine if there are any lead times for any products that may cause any delay. Contractor shall clearly identify any concerns with lead times in writing to the Consultant. If the Contractor does not identify any concerns with products having long lead times, it will be understood there are no long lead time issues, and the Contractor will have all products on-site when needed to complete the job as per the project schedule.
- H. Written approval must be obtained from the Consultant for any proprietary or custom software and/or equipment prior to the beginning of the project.

2.2 PRODUCT DATA

A. Software

1. Approved Manufacturers:
 - a. OpenOptions DNA Fusion

B. Head-End Hardware

1. Controllers and Boards
 - a. Multiplexer
 - 1) Inputs:
 - a) (1) One RS-485
 - 2) Outputs:
 - a) (8) Eight RS-485
 - 3) Power Type: 12VDC or 24VDC
 - 4) Approved Manufacturers:
 - a) Mercury MUX8
 - b) Or Approved Equal
 - b. Two-Door Controller
 - 1) Direct Doors Managed: 2 Doors
 - 2) Power Type: 12VDC or 24VDC
 - 3) Inputs:
 - a) (8) Eight Programmable Inputs
 - b) (1) One RS-485
 - 4) Outputs:
 - a) (6) Six Relays
 - b) (1) One RS-485
 - 5) Approved Manufacturers:
 - a) Mercury MR52-S3
 - b) Or Approved Equal
 - c. Single-Door Controller
 - 1) Direct Doors Managed: 1 Doors
 - 2) Power Type: PoE
 - 3) Inputs:
 - a) (6) Six Programmable Inputs
 - b) (1) One Ethernet
 - 4) Outputs:
 - a) (4) Four Relays
 - b) (1) RS-485
 - 5) Approved Manufacturers:
 - a) Mercury MR62e
 - b) Or Approved Equal
 - d. Input Board
 - 1) Inputs:
 - a) (16) General Purpose Inputs
 - b) (2) Dedicated Inputs
 - c) (1) RS-485
 - 2) Outputs:
 - a) (2) Relays
 - b) (1) RS-485
 - 3) Approved Manufacturers:
 - a) Mercury MR16IN-S3
 - b) Or Approved Equal
 - e. Output Boards
 - 1) Inputs:
 - a) (2) Dedicated Inputs
 - b) (1) RS-485
 - 2) Outputs:
 - a) (16) General Purpose Outputs
 - b) (1) RS-485
 - 3) Approved Manufacturers:
 - a) Mercury MR16OUT-S3

b) Or Approved Equal

2. Unified Power Enclosures and Supplies
 - a. Intelligent Power Controllers:
 - 1) Power Type: 12VDC
 - 2) Relay Module Type: Managed
 - 3) Power Distribution Type: Minimum of 2.5A per door
 - 4) Monitoring Type: Network Module
 - 5) Circuit Breaker Type: Integral Switch
 - 6) Special Requirements:
 - a) Low Battery Disconnect Module
 - b) Direct Fire Alarm Connection
 - 7) Approved Manufacturers:
 - a) Altronix Trove3
 - b) Or Approved Equal
 - b. Battery Backup
 - 1) Battery Type: Lead-acid
 - 2) Power Rating: 12V at 12Ah
 - 3) Charge Type: Rechargeable
 - 4) Approved Manufacturers:
 - a) Yuasa
 - b) Or Approved Equal

2.3 END POINT DEVICES

A. Card Readers

1. Wall Mounted Reader – **(CR)**
 - a. Communication Type: Wiegand/OSDP
 - b. Encryption Type: DESFire EV2, iClass, and Prox
 - c. Mobile Credentialing: Bluetooth and NFC
 - d. Listing: UL294
 - e. Power Requirements: 12VDC
 - f. Mount Type: Wall
 - g. Approved Manufacturers:
 - 1) HID Signo 40
 - 2) Or Approved Equal
2. Mullion Mounted – **(CR1)**
 - a. Communication Type: Wiegand/OSDP
 - b. Encryption Type: DESFire EV2, iClass, and Prox
 - c. Mobile Credentialing: Bluetooth and NFC
 - d. Listing: UL294
 - e. Power Requirements: 12VDC
 - f. Mount Type: Mullion
 - g. Approved Manufacturers:
 - 1) HID Signo 20
 - 2) Or Approved Equal

B. Buttons and Sensors

1. Door Position Sensor(s)
 - a. Door Position Switches – **(DP)**
 - 1) Gap Distance: 3/4-Inch
 - 2) Sensor Size: 1-inch wide
 - 3) Connection: 12-inch lead
 - 4) Connect Type DPDT
 - 5) Mounting Style: Recessed
 - 6) Approved Manufacturers:
 - a) GRI 199-12
 - b) Or Approved Equal
 - b. Surface Mounted Door Position Switches – **(DP)**
 - 1) Gap Distance: 1-Inch
 - 2) Sensor Size: 5/8-inch deep

- 3) Connection: 22-inch lead
 - 4) Connect Type DPDT
 - 5) Mounting Style: Surface
 - 6) Approved Manufacturers:
 - a) GRI 4463A
 - b) Or Approved Equal
 - c. Roof Hatch Mounted Door Position Switches – **(DP1)**
 - 1) Gap Distance: 2.5-Inches
 - 2) Sensor Size: 5/8-inch deep
 - 3) Connection: 36-inch lead
 - 4) Connect Type DPDT
 - 5) Mounting Style: Roof Hatch
 - 6) Approved Manufacturers:
 - a) GRI 4405-A
 - b) Or Approved Equal
 - d. Overhead Door Mounted Position Switches – **(DP1)**
 - 1) Gap Distance: 3-Inches
 - 2) Sensor Size: 5/8-inch deep
 - 3) Connection: 36-inch lead
 - 4) Connect Type SPDT
 - 5) Mounting Style: Overhead Door
 - 6) Approved Manufacturers:
 - a) GRI 4701-A
 - b) Or Approved Equal
 - 2. Request to Exit Device(s)
 - a. Motion Sensor
 - 1) Mounting Type: Wall or Ceiling Mounted
 - 2) Door Operation Type: Fail-Safe or Fail-Secure
 - 3) Color: White
 - 4) Power Type: 12VDC
 - 5) Approved Manufacturers:
 - a) Bosch DS160
 - b) Or Approved Equal
- C. Access Control System Cabling
- 1. Door Hardware Cabling
 - a. Composite Cable with Overall Jacket
 - 1) Cable Rating: Plenum
 - 2) Color: Purple
 - 3) Minimum Composite Cable Types:
 - a) Minimum of 22 AWG with 6-Conductors, with overall shield
 - b) Minimum of 18 AWG with 4-Conductors
 - c) Minimum of 22 AWG with 4-Conductors
 - d) Minimum of 22 AWG with 2-Conductors
 - 4) Approved Manufacturers:
 - a) Windy City Wire
 - b) Belden
 - c) Or Approved Equal
 - 2. Peripheral Device Cables
 - a. REX, Door Position Switches, Relays
 - 1) Cable Rating: Plenum
 - 2) Color: Purple
 - 3) Shielding Type: Unshielded
 - 4) Cable Type: 18 AWG and 2-Conductors
 - 5) Approved Manufacturers:
 - a) Windy City Wire
 - b) West Penn Wire
 - c) Or Approved Equal
 - 3. Exterior Card Reader
 - a. Cable Rating: OSP
 - b. Cable Color: Black

- c. Shielding Type: Overall Shield
 - d. Cable Type: 18 AWG and 6-Conductors
 - e. Approved Manufacturers:
 - 1) Windy City Wire
 - 2) West Penn Wire
 - 3) Or Approved Equal
 - 4. Exterior Devices
 - a. Cable Rating: OSP
 - b. Cable Color: Black
 - c. Shielding Type: Unshielded
 - d. Cable Type: 18 AWG and 4-Conductors
 - e. Approved Manufacturers:
 - 1) Windy City Wire
 - 2) West Penn Wire
 - 3) Or Approved Equal
 - 5. Terminal Strip
 - a. Cable Types: 24AWG -12AWG
 - b. Current Ratings: 800V and 17.5A
 - c. Quantity of Terminations: 16-Connections
 - d. Termination Type: Screw Type or Displacement Type
 - e. Approved Manufacturers:
 - 1) OMEGA
 - 2) Or Approved Equal
- D. Door Hardware
- 1. Door Pull
 - a. Finish: Satin Stainless Steel or Dark Bronze
 - b. Level Style: D-Style
 - c. Core Type: Shall Accommodate Existing Core
 - d. Approved Manufacturers:
 - 1) Precision 2000 Series
 - 2) Or Approved Equal
 - 2. Card Reader Mullion Box
 - a. Card Reader Type: Single Gang
 - b. Mounting Type: Mullion Mount
 - c. Material: Polycarbonate
 - d. Approved Manufacturers:
 - 1) Access Mounts
 - 2) Or Approved Equal

PART 3 - EXECUTION

3.1 COORDINATION REQUIREMENTS

- A. The contractor is responsible for coordinating ACS locations and mounting preferences of all specified security devices with the Consultant prior to installation.
- B. Programming and data entry to be provide by the Contractor unless otherwise noted. Contractor shall coordinate with the Owner to program the Access Control System to provide the following basic functions included but not limited to:
 - 1. Database Importing (Active Directory, CSV file, etc.)
 - 2. Graphics Maps
 - 3. Time zones
 - 4. System Reports
 - 5. Threat / Emergency Management Protocols (Lockdown, Severe Weather, etc.)
 - 6. Role Based User System Access (Admin, User Privileges, etc.)
 - 7. Access levels (Areas, Floor Groups, User Groups, etc.)

8. Schedules (Lock/Unlock, Auto Arm/Disarm, etc.)
9. Auxiliary I/O Devices (Sirens, Strobes, Buzzers etc.)
10. Door Configuration Settings to include but not limited to:
 - a. Anti-Pass Back
 - b. Door Release via Push Button Input
 - c. Door Release via Request to Exit (Maglock ONLY)
 - d. Door Forced / Door Held Alarms Conditions
 - e. ADA Door Settings
11. Special Conditions (Fire Alarm Relays, Hold Opens, Elevators, Gate / Door Operators, etc.).

- C. Coordinate finishes and colors of all equipment with the Owner. Submit all finishes and graphics for all equipment in public areas to the Consultant for approval prior to installation.

3.2 SYSTEM REQUIREMENTS

A. General

1. The Access Control System (ACS) shall consist of software, licensing, doors controllers, access control cabling and all other peripheral components as indicated on the drawing and specified herein.
2. Any devices associated with the installation shall have the latest firmware updates downloads via owner approved secure link from the system software and/or remotely from the manufacturer.
3. The Contractor shall size all equipment accordingly based on the parameters specified herein and in the device schedules.
4. All Access Control software, equipment and system requirements shall be installed per their respective Manufacturer Installation Guidelines.

B. Communications

1. Communication between servers, and workstations, networked based controllers/sub-controllers will communicate using the Owner provided data network unless otherwise noted.
2. The ACS shall also support end to end 128-bit encryption unless otherwise noted.
3. Network device communications shall be via the Separate Security LAN via network cabling as specified by Division 27 (where applicable).
 - a. Contractor shall coordinate with owner for addressing requirements

C. Software

1. Application / Client Workstation Software
 - a. The ACS software installed shall be the most current version; Contractor shall coordinate with Owner prior to the upgrade/install to identify and evaluate any software conflicts. Conflicts shall be brought to the attention of the Consultant prior to installation, via Request for Information.
 - b. Contractor shall coordinate with the Owner to install and configure software on workstation(s) as required to provide a full turnkey ACS system.
2. Access Control System Integration Software
 - a. Provide access control integration software and install on Owner provided virtual machine.
 - b. Contractor shall ensure the specified integration software is installed on hardware that meets both the access control system and integration software recommended hardware requirements.
 - c. Contractor is responsible to provide, install and program all linked integration software and components to provide a fully functional integrated system as specified.
3. Programming Requirements:
 - a. Each door shall be programmed to the following:
 - 1) Door Name/Number
 - 2) Door Prop Status
 - 3) Door Groups as provided by Owner
 - 4) Lockdown
 - b. System shall be set up in a way such that; once the system is armed, only those in the correct user groups can access the building, any person who does not have authority to disarm will not be able to access the building until the system is disarmed.

D. Access Control System Licensing

1. Contractor shall be responsible for providing and applying all necessary licensing key(s) for the specified system(s) as required by the manufacturer(s) for a fully functioning access control system.
2. Contractor shall maintain a secured document with all license key(s) information applicable to this project. All license key(s) are property of the owner and shall be kept secured at all times and then surrendered to the Owner at the end of the project.

E. Access Control System Controller(s)

1. Install Controller(s) in designated locations as indicated on drawings
 - a. The Controller(s) shall be wall mounted in Unified Power Enclosure, as specified.
 - 1) Single cover, hinged, with identical key cylinder lock(s) for all enclosure(s). Hinged double doors will not be accepted.
 - 2) Contractor shall furnish, install, and connect tamper switch for all enclosure(s) to the controller(s) as specified. One alarm input is needed per Unified Power Enclosure to alarm via the ACS system when the enclosure is opened.
 - 3) Contractor shall furnish, install, and connect Battery Fail/Power Loss alarm inputs to the controller(s) as specified. One alarm input is needed per Unified Power Enclosure to alarm via the ACS system in the event of low battery/ power loss conditions.
 - 4) Enclosure(s) shall be mounted flush, plumb, and properly secured on fire-rated plywood using appropriate mounting hardware. Pathways to or from the enclosure(s) shall mechanically protected in a conduit or gutter system. Exposed cabling is not permitted.
 - b. Architecture
 - 1) All existing sites shall re-utilize existing intelligent head-end controllers.
 - a) All added controllers, enclosures, and input boards shall be integrated into the existing RS-485 bus.
 - 2) Door Controllers will be used to communicate with each door with a card reader
 - 3) Any Campus where a new enclosure is being added, a Multiplexer is to be added into the existing panel location, used to extend the RS-485 bus into each new enclosure.
 - a) All RS-485 backbone wiring shall be pulled to connect new panels into the existing RS-485 bus.
 - 4) Input/Output Boards shall be used to monitor any miscellaneous inputs, as specified and drawn.
 - a) All existing exterior door position switches are installed and cabled back to the nearest access control panel. Provide necessary input boards and program to monitor these switches for door prop status, unless noted otherwise.
 - c. Device power shall be provided from a UL listed power supply.
 - d. Controller(s) shall be installed and configured in accordance with the most current manufacturer installation instructions.
 - e. Sufficient Controllers shall be provided to accommodate only the number of card readers initially installed. Enclosure, head-end controller, and card reader controllers shall be sized to allow for growth as required.

F. Card Readers

1. Unless otherwise stated, all card readers shall be wired Wiegand
 - a. All doors being served by a single door controller shall be wired OSDP
2. Provide credential reader(s) as indicated on the drawings.
3. Readers shall be securely mounted flush and plumb on the wall/mullion per the manufacturer installation guidelines.
4. Exterior credential readers shall have surge suppression provided.
 - a. OSP cabling shall route from the surge suppression to the device, mount within the security junction box.
5. Exterior credential readers shall be installed with a weather-proof gasket as recommended by the manufacturer.
6. Exterior credential readers mounted on gates or vehicle pedestals shall be securely mounted in a NEMA rated weather-proof enclosure.

7. Where a weather-proof gasket is not sufficient for weather-proof protection, a sealant for exterior use shall be applied.
8. Readers shall be installed with the manufacturer provided tamper-proof security fasteners, unless otherwise approved in writing by the Consultant. If tamper-proof security fasteners are not provided, the Contractor is responsible for procuring the requested hardware at no cost to the owner.

G. Electrified Door and Mechanical Hardware

1. Contractor shall conceal security cabling in door frame, door channels, walls wherever possible. Submit RFI if site conditions do not allow and propose alternative methods of terminations.
2. Contractor shall not make any modifications to fire-rated doors without obtaining written permission from the Consultant.
3. For all locations requiring Fail-Safe-on power loss or Fire Alarm release, provide all necessary relays and connections. Coordinate with Fire Alarm contractor for all system interconnects.
 - a. For all locations that require power release upon power loss, utilize integral power loss circuit within the provided power supply.
4. Refer to Exhibit A for all Card Reader Schedules and Door Hardware Types.
5. Refer to Exhibit B for all Electrified Door Hardware requirements.
6. All locations shown to have an existing deadbolt shall have a filler plate provided on both sides, with the deadbolt to be removed.
7. All locations shown to have a door pull added to the existing hardware, shall be color matched to the existing hardware. Submit an RFI to confirm the color matched to each location.

H. Electrified Locking Mechanism Power Supply

1. Provided by above referenced Unified Power Enclosure unless otherwise noted.
2. Power supplies specified herein are intended for low amperage inrush (≤ 1 Amp) devices only. "High Amp Inrush" or devices with inrush currents over 1 amp and their associated power supplies shall be specified and provided by others, unless otherwise noted.
3. Contractor to perform Amperage load calculations to ensure combined power draw of electrified door hardware and access control devices does not exceed the maximum output of the power supply as recommended by the manufacturer while also allowing room for future growth.
4. Contractor to perform Voltage Drop calculations to ensure the location of each electrified door power supply is within the maximum distance allowed based on voltage, wire gauge and distance from the power supply to each door location.

I. Door Position Sensors (Door Contacts, Tamper Switches)

1. Provide magnetic concealed door position switches, surface mount door position switches and overhead door position switches to monitor the open/closed status of doors as specified herein and as indicated on the drawings.
2. The contractor shall ensure the circuit of the door position sensor shall match the physical status of the door opening i.e. Normally Closed when the door is closed.
3. Exterior mounted door position sensors shall terminate using the appropriate outdoor-rated weatherproof connections and fasteners based on site conditions.
4. Provide flexible metallic conduit (as required) from the sensor location to the associated junction box as indicated on the drawings. Conduit shall be securely fastened to the structure using proper fasteners based on site conditions.
5. Contractor must ensure adequate spacing between contact and magnets to avoid abrasion / damage to the device.
6. Install end of line resistors for line supervision. Refer to manufacturer for recommended resistance values
7. Tamper shall be mounted inside the enclosure on key switch side.

J. Request-to-Exit

1. Request-to-Exit Motion Sensor
 - a. All door locations shown within the scope of work, shall have a wall/ceiling mounted REX sensor provided.
 - b. Motion sensor shall be mounted flush, plumb, and properly secured on a single gang box or mechanical brace using appropriate mounting hardware and trim plate.

- c. Motion sensors shall be positioned close to the door opening and angled to prevent tampering from forced entry. Contractor shall ensure devices mounted in the ceiling space are not obstructed or impacted when servicing in relation to other ceiling mounted devices (Exit signs, smoke detectors, lighting fixtures, etc.)

K. Access Control System Power Supplies and Power Distribution

- 1. Unless otherwise noted, all power supplies shall be hardwired to the 120VAC circuit. No pigtails / plugs shall be acceptable.
- 2. Enclosed Wall Mounted Access Control Panel Power Supply
 - a. The Contractor shall provide and install devices as indicated on the drawings.
 - b. Contractor shall refer to Division 8 Finish Hardware schedules and system requirements for sizing and quantity of boards in the enclosed power supply.
 - c. The Contractor shall provide and install Power Control Modules as specified.
 - 1) Each Lock power output cable shall be terminated to a dedicated port on the Power Distribution Module specified.
 - d. The Contractor shall provide and install Power Distribution Modules as specified.
 - 1) Each request-to-exit motion (where required) cable shall be terminated on a dedicated port on the Power Distribution Module.
 - e. The Contractor shall size each enclosure(s) with power supplies as specified to include an additional total amperage of at least 20% additional maximum amperage output per enclosure for future expansion as required.

L. Backup Battery(s)

- 1. The Contractor shall provide and install one (1) back up battery for each 12 VDC power supply and two (2) back up batteries for each 24 VDC power supply; this includes all existing and newly provided Access Control Unified Power Enclosures.
- 2. The Contractor shall label the install date for each battery with printed labels.
- 3. For large installations where batteries do not fit in the provided enclosure, the Contractor shall provide a separate battery enclosure to house all necessary back-up batteries.

M. Access Control Cabling

- 1. Wiring Techniques
 - a. All cables shall be pre-tested for shorts prior to final device terminations after cables are installed.
 - b. The Contractor shall install a 2-foot service loop to be coiled, mounted, and stored in the provided enclosure(s) as detailed in the drawings. If an enclosure is not provided for the specified devices herein, the service loop shall be installed on a j-hook in the nearest accessible ceiling space closest to the device.
 - c. The Contractor shall install a 2-foot service loop to be coiled, mounted, and stored at the Access Control Panel.
 - d. Install code compliant fireproofing techniques for all penetrations of fire rated partitions and slabs, where the penetrations are made by or used for installation of the ACS.
 - e. All wire and cable shall be continuous from device location to the final point of termination ("Home Run"). No mid-run cable splices shall be allowed.
 - f. Wire and cable within control panels, power distribution cabinets and other security enclosures shall be neatly installed, completely terminated, pulled tight with slack removed and routed in such a way as to allow direct, unimpeded access to the equipment within the enclosure. All wire and cable shall be bundled and tied. Velcro cable ties shall be utilized.
 - g. Neatly bundle and wrap all horizontal/vertical runs (above accessible ceilings and not within conduit) wire and cable at intervals as code requires. Provide supports as required. All supports shall be UL listed for the application.
 - h. All system wiring within vertical riser shafts (as required) shall be bundled, wrapped and tied to the structure at one-meter intervals in order to isolate it from other wire and cable within the shaft. Additionally, all wire and cable within the shaft shall be supported at least every two floors using manufacturer approved vertical management hardware and installation methods. Provide all personnel and equipment necessary to install and support the cable. All equipment shall be UL listed for the application.
 - i. Provide grommets and strain relief material where necessary to avoid abrasion of wire and excess tension on wire and cable.

N. Labeling

1. Contractor shall verify room numbers and confirm the final room numbering scheme and Owner's current standard in writing in advance via RFI prior to generating any labels.
2. Cables overall sheath shall be labeled within six-inches from the point the cable enters/exits the Unified Power Enclosure.
3. Cables shall be labeled within one-inch from the termination point inside the Unified Power Enclosure.
4. Cables shall be labeled within one-inch from the termination point at the device end.
5. Cables shall be labeled identically at both ends.
6. Label all controls as necessary to agree with their function.
7. All labeling in the field shall match the same labeling scheme in the closeout documents.

O. Surge Protection

1. Protect all exterior devices, control, power, signal cables and conductors that are power surges. Each surge protector shall be UL Listed.
2. Unless otherwise noted, surge protection devices shall be installed at both the edge and head end of the cabling run.
3. Surge devices shall be installed as close as possible to the equipment they are protecting.
4. Surge Protection shall be properly installed in an accessible ceiling or enclosure space to allow for cable removal during troubleshooting.
5. Include surge protection device locations on as-builts and shop drawings.
6. Provide protection against spikes, surges, noise, and other line problems for all system equipment and components.
7. Provide proper ground surge protection devices per the manufacturer installation requirements.

3.3 TESTING REQUIREMENTS

A. System Start-Up

1. The Work shall be complete and ready to operate prior to final acceptance.
2. The Consultant shall assist in establishing procedural guidelines and in defining terminology and conditions unique to the Owner's operation.

B. Substantial Completion

1. In order to qualify for the Consultant's consideration of Substantial Completion, the Work must, at a minimum, meet the following requirements:
 - a. Installation of all devices must be completed.
 - b. All sub-system interfaces must be complete and operational.
2. Substantial Completion shall not be construed as final acceptance of the Work.

C. System Acceptance

1. Final acceptance testing of the Work will be conducted by the Owner/Consultant.
2. Before system acceptance testing, Contractor shall conduct a complete in-house QA/QC test of the entire Access Control System and provide a written report on the results of that test. During the QA/QC test the Contractor shall place the ACS in service mode and calibrate and test all equipment.
3. Prior to the final acceptance test, coordinate with the Consultant for security related construction clean-up and patch work requirements. Security equipment closets and similar areas should be free of accumulation of waste materials or rubbish caused by operations under the Contract. At completion of the Work, remove all waste materials, rubbish, the Contractor's and its subcontractors' tools, construction equipment, machinery and all surplus materials.
4. The Contractor shall submit two sets of preliminary (draft) Record Drawings to the Consultant. The preliminary Record Drawings are to be used by the Consultant to conduct the system final test.

5. Following completion of the initial testing and correction of any noted deficiencies, conduct a five-day burn-in test. The intent of the burn-in test shall be to prove the Access control system functions by placing it in near real operating conditions. During this period, the Access control system shall be fully functional and programmed such that all points, interfaces, controls, reports, messages, prompts, etc. can be exercised and validated. Record and correct any system anomaly, deficiency, or failure noted during this period. Scheduling of the final acceptance test shall be based on a review of the results of this burn-in test.
6. Deliver a report describing the results of functional tests, burn-in tests, diagnostics, calibrations, corrections, and repairs including written certification to the Consultant that the installed complete Access control system has been calibrated, tested, and is fully functional as specified herein.
7. Upon written notification from the Contractor that the Access control system is completely installed, integrated and operational, and the burn-in testing completed, the Consultant will conduct a final acceptance test of the entire system.
8. During the final acceptance test by the Consultant, the Contractor shall be responsible for demonstrating that, without exception, the completed and integrated system complies with the contract requirements. All physical and functional requirements of the project shall be demonstrated and shown. This demonstration will begin by comparing "as built" conditions of the Access control system to requirements outlined in the Specification, item by item. Following the Specification compliance review, all Access control system head-end equipment will be evaluated.
9. The functionality of the various interfaces between systems will be tested.
10. Following the Access control system head-end equipment and console review, the installation of all field devices will be inspected. This field inspection will weigh heavily on the general neatness and quality of installations, complete functionality of each individual device, and mounting, backbox and conduit requirements compliance.
11. All equipment shall be on and fully operational during all testing procedures. Provide all personnel, equipment, and supplies necessary to perform all site testing. Provide a minimum of two employees familiar with the system for the final acceptance test. One employee shall be responsible for monitoring and verifying alarms while the other will be required to demonstrate the function of each device. Supply at least two two-way radios for use during the test. A manufacturer's representative may be present on site to answer any questions that may be beyond the technical capability of the Contractor's employees, if the Contractor so elects or by specific request of the Consultant or Owner, at no charge to the Consultant or Owner.
12. Upon successful completion of the final acceptance test (or subsequent punch list retest) the Consultant will issue a letter of final acceptance.
13. The Consultant retains the right to suspend and/or terminate testing at any time when the system fails to perform as specified. In the event that it becomes necessary to suspend the test, all of the Owner's/ Consultant's fees and expenses related to the suspended test will be deducted from the Contractor's retainage. Furthermore, in the event it becomes necessary to suspend the test, the Contractor shall work diligently to complete/repair all outstanding items to the condition specified in the Specification and as indicated on the Drawings. The Contractor shall supply the Consultant with a detailed completion schedule outlining phase by phase completion dates and a tentative date for a subsequent punch list retest. During the final acceptance test, no adjustments, repairs or modifications to the system will be conducted without the permission of the Consultant.

3.4 TRAINING REQUIREMENTS

- A. Provide for (8) hours of training for five (5) persons on each system.
- B. Provide a test report showing the system has been 100% tested and 100% operational prior to training / demonstration.
- C. Coordinate with the Owner to establish a training outline and schedule. Submit a comprehensive training curriculum to the Owner once all preliminary coordination is complete. The Owner will revise and comment on the curriculum as required.
- D. Contractor training shall be conducted onsite/virtually with a manufacturer's representative in attendance.
- E. Operator training shall include, but not be limited to the following:
 1. All operating procedures and graphic user interface (GUI)
 2. System configuration

3. Alarm acknowledgement, alarm response logging, and map graphics functionality
4. Image capture, badge printing, and print ribbon replacement.

F. Administrative training shall include, but not be limited to the following:

1. All operating system procedures, configuration variables and graphic user interface (GUI)
2. Database functions and setup
3. Cardholder input and deletion procedures
4. Report generation
5. Card format configuration
6. Badge creation and design

G. Record, label, and catalog all training and “user’s manual” written specifically for the Owner personnel onsite, for daily routine operations of the systems. Provide the user’s manual to the Owner for future in-house training sessions and / or reviews. Furnish all temporary equipment necessary for recording all training sessions. Maintain accurate and up-to-date time sheets of all training sessions.

H. The Owner reserves the right to use any excess training hours, not used by the time of system completion, for future training as requested until the total number of training hours has been completed.

3.5 PROJECT CLOSEOUT DOCUMENTATION REQUIREMENTS

A. As-Built Drawings

1. Drawings shall be provided to the Owner/Consultant at the time of substantial completion. Final payment will not be recommended until drawings are received and approved by the Owner/Consultant.
2. Unless otherwise requested, Contractor shall provide digital copies of close-out documents, and deliver to the Owner/Consultant electronically.
3. As-Built drawings shall be produced in AutoCAD/Revit in the most current or compatible version and provided electronically in .dwg and/or .pdf format.
4. Drawings shall be provided in the original size as issued by the Consultant.
5. Drawings shall retain the formatting and title block of the original drawings as issued by the Consultant.
6. Provide a conformed set of Drawings as related to the project, depicting the condition of the access control system as installed to include but not limited to:
 - a. ASI, PR and Addendum items installed throughout the duration of the project.
7. Provide a hard copy of the conformed set of drawings to be physically stored at the end of the project in a designated Access Control System enclosure. Coordinate with Owner for final storage location.
8. Drawings shall be provided utilizing the original scale and shall include the exact dimensions and locations of the following not limited to:
 - a. Access Control System Riser / Signal Flow Diagrams
 - b. Access Control System Backboard Layouts
 - 1) To include access control boards, power supplies, pathways, etc.
 - c. Sleeves, Backbone Cabling and Communication pathways
 - d. Access Control System device locations and labeling scheme.

B. Operation & Maintenance Manuals

1. Unless otherwise noted, provide O&M manuals electronically to Owner to include all drawings, product datasheets, hardware manuals as related to the project.
2. Coordinate with the Owner for provisioning of physical storage devices (Hardcopy, Flash Drive, CD/DVDs)

C. Manufacturer’s Product Warranty

1. Certificate of product warranty shall be provided to the Owner/Consultant at the time of final system acceptance. Final payment will not be recommended until this certificate of product warranty is received and approved by the Consultant.
2. The manufacturer of the solution shall furnish a product warranty as per the specifications starting at final system acceptance.

3. One original and two copies of the Manufacturer's product warranty shall be provided.

D. Contactor's Statement of Warranty

1. Statement of warranty shall be provided to the Consultant at the time of substantial completion. Final payment will not be recommended until statement of warranty is received and approved by the Consultant.
2. Contractor shall furnish a minimum of a one (1) year warranty on all materials, labor and workmanship starting at final system acceptance.
3. One original and two copies of Contractor's warranty terms and conditions to include contact information (i.e. Contractor name, Point of Contact, address, phone number and email address) and start and end date for warranty call outs.

END OF SECTION 28 10 00