

SECTION 28 05 00

COMMON WORK RESULTS FOR ELECTRONIC SECURITY SYSTEMS

PART 1 - GENERAL

1.1 DESCRIPTION

- A. This Section covers general security systems requirements and components common to multiple security subsystems specified in related sections of Division 28.

1.2 RELATED SECTIONS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.
- B. These common work results for electronic security systems apply to the following:
 - 1. Section 28 05 13, Conductors and Cables for Electronic Security.
 - 2. Section 28 05 28, Pathways for Electronic Security.
 - 3. Section 28 08 00, Commissioning of Electronic Security.
 - 4. Section 28 10 00, Access Control.
 - 5. Section 28 20 00, Video Surveillance
 - 6. Section 28 31 00, Intrusion Detection
- C. The interfacing of power and grounding provisions with work provided under these Sections is covered under these Sections.

1.3 DEFINITIONS

- A. Words with well-known technical or trade meanings are used according to such recognized meanings.
- B. The words "Security Contractor" or simply "Contractor" means the organization charged with installation and configuration of the Systems described herein.
- C. The words "Basis of Design," mean a device representing the benchmark or minimum requirements in the Specifications or Drawings for this Project. This shall not be interpreted as a sole-source requirement, unless it is stated that "no substitutions are allowed."
- D. The words "as required" mean as required to provide a complete and satisfactory Work in conformance with the Drawings and Specifications.
- E. The word "new" means new Work provided by the Contractor. Work not indicated as existing shall be considered new work provided by the Contractor.
- F. The word "provide" means furnish, install, connect, test, and make ready for use.

- G. The words "relocate existing" mean remove existing item from present location. Reinstall, reconnect, and test existing items and make ready for use at new location as indicated on the Drawings.
- H. The words "remove existing" mean remove existing item and return item to the Owner.
- I. The word "replace" means remove existing item and return item to the Owner. Provide new items as indicated on the Drawings or as specified herein.
- J. The word "work" means the completed construction required by the Drawings and Specifications and includes labor necessary to produce such construction, and materials and equipment incorporated or to be incorporated in such construction.
- K. The word "furnish" means supply item as specified herein. Item will be installed by others.
- L. Infrastructure: as used herein shall mean conduit, raceway with required boxes, fittings, connectors, and accessories, completely installed.

1.4 QUALITY ASSURANCE

- A. Provision of manufactured components, installation, wiring and testing shall be the responsibility of a single Contractor.
- B. Qualifications of Electronic Security Systems Contractor:
 - 1. Installation of each of the electronic security subsystems shall be provided by a person or persons having completed, as a minimum, the factory training recommended by the manufacturer of each subsystem and have direct field experience in the installation of a minimum of 3 projects of similar scope and size within the past 5 years.
 - 2. The Electronic Security Systems Contractor shall be a contractor regularly engaged in the sale, installation, integration, maintenance, and service of electronic security systems.
 - 3. Additional requirements are defined in other security sections.
- C. Supervision of Work:
 - 1. Contractor shall employ a competent Foreman to be in responsible charge of the Work. Foreman shall be on the project site daily during the execution of the Work.
 - 2. Contractor's Foreman shall be a regular employee, principal, or officer of Contractor, who is thoroughly experienced in projects of a similar size and type.
- D. Qualifications of Technicians:
 - 1. All security systems Work shall be performed by electronic technicians thoroughly trained in the installation and service of specialty low-voltage electronic systems.
 - 2. Journeymen or Master Electricians may be used to install conduit, raceways, wiring, and the like provided that final termination, hook-up, programming, and testing is performed by qualified electronic technicians, and that all such Work is supervised by the Contractor's Foreman.

3. Incidental Work, such as cutting and patching, lock hardware installation, painting, carpentry, and the like shall be accomplished by skilled crafts persons regularly engaged in such type of work. Such Work shall comply with the industry standards applicable to that respective industry or craft.
 4. 120 V AC power wiring and connections shall be performed by a qualified Journeyman or Master Electrician, licensed to perform such work in the State of New Hampshire.
- E. Subcontractors:
1. Definition: a Subcontractor is a person or entity who has a direct contract with the Contractor to perform any of the Work at the site.
 2. Use of any Subcontractor is subject to the approval of the Owner. The Contractor shall identify Subcontractors on the Bid Form. The Contractor shall make no substitution for any Subcontractor previously selected without approval from the Owner.
 3. Contractor's Foreman shall be on the project site daily during periods when Subcontractors are performing any of the Work. Contractor's Foreman shall be in responsible charge of Work, including any Work being performed by Subcontractors.
 4. By an appropriate written agreement, the Contractor shall require each Subcontractor, to the extent of the Work to be performed by the Subcontractor, to be bound to the Contractor by the terms of the Drawings and Specifications, and to assume toward the Contractor all the obligations and responsibilities which the Contractor, by these documents, assumes toward the Owner.
- F. Supply only new equipment, parts and material currently manufactured at the time of submittal and operate only for testing as part of installation procedure.
- G. Codes, standards, and regulations are defined on the Drawings and are minimum requirements. Where the requirements of these Specifications or other requirements shown or indicated on the Drawings exceed those of the codes, standards and regulations, the Drawings or Specifications shall govern.

1.5 SUBMITTALS

- A. Within 15 days after notice to proceed, submit a schedule indicating the proposed submission date of each submittal specified herein. Schedule shall anticipate the submittal review time, the possible need for resubmittals, and the time required for fabrication, shipping, and integration into the construction sequence. The Engineer will advise of any conflicts in reviewing submittals that the proposed schedule presents.
- B. Resubmittals required to address review comments shall include a cover transmittal with a written explanation of how each review comment has been addressed.
- C. Submittals not specifically required, or not complying with the format requirements, will be returned unreviewed.
- D. Submittals are required before installation begins. Equipment shall not be ordered prior to receipt and approval of submittals.
- E. Action Submittals

1. Submittals shall be submitted as a single package.
2. Product Data:
 - a) Provide product data sheets for equipment, materials, and cables in PDF format. PDF submittals shall be organized in the same order as the specifications and include a table of contents and hierarchical bookmarking system to clearly identify the location of each product within the submittal.
 - b) For product data sheets containing multiple options for the same component, indicate the exact model or option provided on the submittal cover sheet and on the product data sheet by highlighting or using a red arrow.
 - c) Indicate deviations, if any, including any from the manufacturer's installation instructions.
3. Shop Drawings:
 - a) Reproductions or electronic versions of design drawings shall not be used in preparation of shop drawings.
 - b) Floor plans and diagram shop drawings shall be prepared in AutoCAD standard DWG format and submitted as PDF plots on the same drawing size and at the same scale as the design drawings.
 - c) Include floor and site plans indicating equipment locations.
 - d) Wiring diagrams shall indicate proposed connections of equipment, model numbers, and designations for cables and termination points.
 - e) Provide plans and elevations of equipment cabinets, equipment racks and wall mounted equipment. Plans shall include enlarged (min. 1/4" = 1'-0" scale), to scale plan (top), and front views. Indicate the location of all specified electronics.
 - f) Provide project specific manufacturer shop drawings of fabricated or modified units, if any.
 - g) Provide UPS (Uninterrupted Power System) load calculations with UPS submittal.
 - h) Provide riser diagrams indicating components of the system and proposed cabling between these components.
 - i) Provide detailed project specific mounting diagram for each type of device including raceway and back box requirements. These details shall be referenced in the floor plans or schedules.
 - j) Provide proposed elevation for each security enclosure location, including equipment identification and model/part numbers.

F. Informational Submittals:

1. Required raceways and power outlets, including quantity, locations, and capacity characteristics.
2. Environmental requirements, including heat release.

G. Close-out Submittals:

1. Functional Test Reports: Provide a spreadsheet with all electronic security system devices and major components listed in the first column by device designator (e.g., camera number) with each test parameter listed by name (or code) in the remaining columns.

2. Operations and Maintenance Documentation Package: The Security Systems Performance Verification Supervisor shall compile and prepare documentation for equipment and systems covered in these Security Specifications and deliver this documentation for inclusion in the operation and maintenance manuals prior to the training of the Owner's personnel. The Owner shall receive a copy of the operation and maintenance manuals for review.
3. Instruction of Operating Personnel: The Security Systems Performance Verification Supervisor shall schedule, coordinate, assemble and deliver the documentation of the training required by this section.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Electronic security equipment.
 1. Store in a temperature and humidity-controlled environment in the manufacturer's original sealed containers. Maintain ambient temperature between 50° and 85° Fahrenheit and not more than 80% relative humidity, non-condensing.
 2. Open each container; verify contents against packing list, and file a copy of packing list, complete with container identification for inclusion in operation and maintenance data.

1.7 LICENSING

- A. Licensing for products shall be provided for one (1) year from the date of substantial completion.

1.8 FIELD CONDITIONS

- A. Systems or equipment installed in environmentally controlled areas shall be designed for performance in the following conditions:
 1. Temperature: 40°F to 95°F.
 2. Humidity: 20% to 80% RH.
 3. Air purity: systems shall be capable of continuous operation in an environment where the level of dust, lint, paper fiber, and other airborne particles is equal to that found in a standard office.
- B. Systems or equipment installed in indoor environmentally uncontrolled areas shall be designed for performance in the following conditions:
 1. Temperature: 0°F to 120°F.
 2. Humidity: 5% to 95% RH.
- C. Systems or equipment installed in outdoor areas shall meet performance requirements specified herein in the following conditions:
 1. Wind-driven dust, dirt, sand, and snow for 6 hours.
 2. Rain at a maximum rate of 4" per hour.
 3. Ice loads up to 2" measured radially to exposed surfaces.
 4. Wind loads as indicated on the Drawings.
 5. Sleet with wind: 55 mph, maximum.

6. Snow cover: 4' maximum, measured vertically.
7. Humidity: 0% to 100% RH.
8. Temperature: -40°F to 120°F.

1.9 SPACE CONDITIONS

- A. Verify dimensions of equipment, equipment arrangements, space availability (including any millwork or cabinetry provided by others) and provide systems that work within the constraints of the space available. Notify the Engineer of any situation where space constraints are a problem, prior to the ordering or purchase of equipment. The Contractor shall bear the expense of providing alternate equipment which will work within the available space if space availability problems are discovered after equipment is ordered.
- B. Drawings are diagrammatic in nature and, unless explicitly dimensioned, indicate approximate locations of equipment and components. Changes in the location, and offsets, of same which are not shown on the Drawings but are necessary to accommodate building conditions and coordination with the work of other trades, shall be made prior to initial installation, without additional cost to the Owner.
- C. Provide access to equipment and components needing operation, service, or maintenance within the system's life.

1.10 WARRANTY

- A. Equipment shall be warrantied to be free of faulty workmanship and defects for 1 year from the date of substantial completion.
- B. Replace defective materials and repair faulty workmanship within 2 days of notification at no cost to the Owner during warranty period.
- C. In addition to warranty, provide maintenance service for the warranty period, including at least 2 semi-annual visits to site for checking and adjustment of equipment. During this period, answer service calls within 24 hours. During this period, maintenance calls shall be completed within 3 days of notification and at no cost to the Owner.
- D. Software/firmware maintenance: new releases or updates of hardware, software, applicable user manuals, technical and alert bulletins released by the security systems manufacturers shall be applied to the system at no cost to the Owner during the warranty period.

PART 2 - PRODUCTS

2.1 GENERAL

- A. Licenses and Licensing Requirements:
 1. Provide all software and hardware licenses required for complete and functional systems as indicated on the Security System Drawings and herein, whether specifically called out or not.

2.2 EQUIPMENT ENCLOSURES

A. General:

1. Enclosures shall be rated and certified to seismic applications based on seismic criteria shown on the drawings and information specified herein under "Seismic and Wind Restraints."

B. Exterior Equipment Enclosures:

1. Outdoor, above grade:

- a) NEMA 4.
- b) Minimum 14-gauge thick mild steel, stainless steel, or aluminum with seams continuously welded and ground smooth and an outdoor grade polyester powder grey paint finish.
- c) Provide a continuous hinge with 3-point latching mechanisms and locking handles.
- d) Provide heat exchanger or air conditioning where required to maintain an internal temperature of 125°F or less. Cooling capacity shall meet or exceed heat load generated due to internal components, maximum ambient air temperature, and direct sunlight.
- e) Size as required to contain equipment and accommodate heat load.
- f) Manufacturer: Hoffman, Omega, or Purcell Systems.

2. Outdoor, below grade:

- a) NEMA 6 (waterproof, rated for occasional submersion) for outdoor below grade locations (i.e., manholes, handholes, or direct buried).
- b) Manufacturer: O-Z/Gedney or approved equal.

2.3 FIBER OPTIC TRANSMISSION AND SIGNAL EQUIPMENT:

A. Fiber Optic Transmission Systems:

1. System shall operate between 800 nm and 900 nm or 1250 nm and 1350 nm wavelength.
2. Full range automatic gain control.
3. Signal-to-noise ratio: 54 dB minimum.
4. Bandwidth: 5 Hz to 10 MHz.
5. Components shall utilize straight tip type connectors.
6. Operating temperature: -40°F to 165°F.
7. Storage temperature: -40°F to 185°F.
8. UL listed.
9. Surface or rack mount.
10. Distance up to 3.5 miles without repeaters.
11. Manufacturer: American Fibertek, Comnet, or Interlogix (formerly IFS).

B. Rack or Wall Mount Fiber Enclosures:

1. Fiber enclosures shall be a complete modular system of components and shall provide the following:
 - a) Splicing.
 - b) Termination.
 - c) Routing.
 - d) Strain relief.
 - e) Radius limiting.
 - f) Cable fastening: Panduit VWS106-C.
 - g) Storage.
 - h) Direct-connection, UON.
2. Splice modules shall be fully equipped for required quantity of splices with:
 - a) Cable strain relief hardware.
 - b) Sliding splice trays.
 - c) Routing guides.
3. Fiber enclosures shall be equipped with either lockable or screw clamp doors.
4. Fiber enclosures shall be sized to accommodate the required quantity and type of fibers.
5. Fiber enclosures shall be complete with double-sided female ST couplers in each position.
6. Fiber enclosures shall have panel front jumper and cross-connect cable management.

2.4 AC POWER

A. General:

1. AC power equipment shall have LED or lamp status devices to indicate the systems are on.

B. AC Power Strips:

1. AC power receptacles, 125 V, 15 A capacity.
2. Outlets shall have integral transient suppression in accordance with UL 1449-2014(R2018).
3. Mounted to standard 19" rack panel.
4. Manufacturer: Atlas Sound, Emerson Network Power, Leviton, Lowell, or Middle Atlantic Products.

C. Power Supply Equipment:

1. Power Supplies:

- a) Power supplies shall be provided for detectors, panels, and accessories.
- b) Power supplies shall meet or exceed the manufacturer's recommendations for the individual devices served.
- c) Devices requiring common voltages shall be powered from a common power supply at the locations indicated on the Drawings. Provide power distribution modules with individually fused or PTC outputs.

2. Battery back-up:
 - a) Standby batteries with chargers shall power microprocessor-based units and panels in case of a primary power failure.
 - b) Batteries shall be sized to provide 105% capacity for 4 hours.
 - c) Standby batteries shall be sealed lead-calcium, lead-acid, or nickel-cadmium. Power supplies shall be solid state type.
 - d) Controls shall be designed to maintain full battery charge when primary power is available.
 - e) Batteries shall be recharged to 85% capacity within 24 hours from battery use.
 - f) Microprocessor-based units and panels shall be automatically transferred to battery power upon loss of primary power and return to primary power upon restoration.
 - g) Alarms shall not be initiated during switchover. An alarm shall be initiated upon failure of battery and/or primary power.

D. Low voltage surge protection devices (SPDs): SPDs shall incorporate silicon avalanche technology, shall operate bidirectionally, and have a turn-on and turn-off time of less than 5 nanoseconds. Additional minimum requirements include:

1. Non-coaxial SPDs shall be UL listed in accordance with UL 497B-2004. Coaxial cable SPDs shall be designed in accordance with NFPA (National Fire Protection Association) 780-2020.
2. Maximum single impulse current conductor-to-conductor or conductor-to-ground: 10000 A, 8 x 20 μ s waveform, or 200 A, 10 x 1000 μ s waveform.
3. Pulse life rating: 3000 A, 8 x 20 μ s waveform, 2000 occurrences, or 50 A, 10 x 1000 μ s waveform, 200 occurrences.
4. Maximum clamping voltage at 100 A, 10 x 1000 μ s waveform, with the peak current not to exceed the normal applied voltage by 150%, except for coaxial cable suppressors with peak current, the maximum clamping voltage shall not exceed the normal applied voltage by 200%.
5. Failure mode: fail short.
6. Manufacturer: Advanced Protection Technologies, Ditek, Emerson, Lightning Eliminators & Consultants, or Transtector.

E. Ground Bus Bars:

1. Solid copper, minimum 6" x 0.75" x 0.25".
2. Free from surface corrosion.
3. Drilled and tapped 1/4-20 and 10-24 to terminate incoming conductors individually.

2.5 UNINTERRUPTIBLE POWER SUPPLY (UPS):

A. Rack-Mounted UPS:

1. Line interactive topology. Size for 125% of load served.
2. The system shall be a self-contained rack mountable unit designed for the support of computers.
3. Audible noise shall not exceed 52 dBA at 3'.

4. Batteries: lead-calcium, lead-acid, or nickel-cadmium type sized to sustain the UPS at full rated load for 4 hours.
5. Integral lightning and surge protection complying with IEEE C62.41.1-2002 (R2008), IEEE C62.41.2-2002 (COR 1-2012), and UL 1449-2014(R2018).
6. The UPS shall provide the following characteristics:
 - a) Nominal input voltage: 120 V AC.
 - b) Integral automatic current and overvoltage protection.
 - c) Electrical noise isolation: 5 dB to 45 dB common mode, 28 dB to 80 dB normal mode.
 - d) Recharge time: less than 10 hours.
 - e) Transfer time: 0 ms.
 - f) Efficiency: 95%.
 - g) Manufacturer: APC, Eaton, or Tripp-Lite.

2.6 SEISMIC AND WIND RESTRAINTS

- A. Provide restraint devices as required for vibration isolated and nonvibration isolated systems and equipment components. Provide calculations to determine restraint loadings for specific equipment to be installed resulting from seismic forces on equipment. Seismic restraint calculations shall be signed by a licensed engineer employed by the seismic restraint device manufacturer.
- B. For roof-mounted equipment and components, the seismic acceleration and wind loads shall be calculated, and the highest load shall be used for the seismic restraints and vibration isolators.
- C. Exceptions for components listed within the applicable project building code may be utilized. However, use of exceptions shall be noted with submitted seismic restraint calculations.
- D. Floor-Mounted Restraints:
 1. Restraints for neoprene vibrations isolators shall consist of Type DN isolators with the addition of welded steel housings to resist seismic forces.
 2. Manufacturer: Kinetics Noise Control, Mason Industries, VMC Group, Vibration Eliminator, or Vibro-Acoustics.
- E. Suspended Restraints:
 1. Restraints for vibration isolated suspended systems or equipment shall consist of galvanized or stainless-steel aircraft cables with end connection fittings designed to swivel to ensure proper cable alignment and avoid bending of cable.
 2. Restraints for nonvibration isolated suspended equipment or raceways shall consist of steel angle or Unistrut with anchor bolts and end connection fittings designed to swivel to the final installation angle.
 3. Manufacturer: Atkore Unistrut, International Seismic Application Technology, Kinetics Noise Control, Mason Industries, Tolco, VMC Group, Vibration Eliminator, or Vibro-Acoustics.

2.7 MISCELLANEOUS EQUIPMENT

- A. Custom control panels: aluminum-backed plastic laminate engraving stock, engraved and filled anodized aluminum plates, or anodized photo-sensitized aluminum plates. The minimum plate thickness shall be 0.125".
- B. Key Switches:
 - 1. Single-gang box mounting.
 - 2. Two position key operated type.
 - 3. Dual double-pole double-throw type.
 - 4. Two LED indicators, one red and one green, or one bicolor LED.
 - 5. Tamper resistant mounting screws.
 - 6. Momentary contacts rated 5 A at 120 V AC.
 - 7. Manufacturer: Delta Controls, Dynalock Corporation, or Securitron MK series.
- C. Identification materials: nameplates shall be white core plastic laminate with engraved lettering. Nameplates for individual devices shall have 0.25" high letters.

PART 3 - EXECUTION

3.1 GENERAL

- A. Provide incidental equipment or devices to provide a complete and operable system.
- B. Verify correctness of parts lists and equipment model numbers and conformance of each component with manufacturer's specifications.
- C. Equipment shall be installed in accordance with the manufacturer's instructions.
- D. Equipment, except portable equipment, shall be held in place. This shall include equipment, enclosures, components, and cables. Fastenings and supports shall support their loads with a safety factor of at least 3 unless otherwise specified herein.
- E. Prevent and guard against electromagnetic and electrostatic hum and install equipment to provide safety for the operator.
- F. Repair or replace any equipment or materials damaged during the construction period.
- G. Provide power connections from existing panels to specialty equipment.
- H. Exposed equipment, equipment supports, and components shall have a flat dark gray or black finish unless otherwise specified herein.
- I. Cybersecurity Requirements:
 - 1. Change all default passwords upon setup. Provide unique passwords for each device type. Provide passwords to Owner upon turnover of the system. Create strong passwords:
 - a) Include numbers, symbols, uppercase and lowercase letters.
 - b) The password shall be more than eight characters long.

- c) Avoid any password based on repetition, dictionary words, letter or number sequences, usernames, relative or pet names, or biographical information (birthday).
2. Two factor authentication (network, server, and client only).
3. Enable encryption, if not already enabled.
4. Where supported, configure the systems to provide alerts upon multiple failed login attempts.
5. Restrict access to open USB ports to prevent malicious agents or malware from being injected into the security network.
6. Configure the system to provide automated alert process if foreign devices (e.g., non-authorized devices like laptops, rogue access points, etc.) are attached to the security network.
7. Configure the system to provide automated alerts if unauthorized file deletions or modifications occur (network only).
8. Configure the systems to provide automated checking of drivers and firmware to detect if the drivers and firmware are up to date (network, server, and client only).
9. Configure the system to provide automated alerts if a camera or other device is tampered with (the lens is covered, the power removed, scene changes, etc.).

3.2 EQUIPMENT ENCLOSURES

- A. Where controls or equipment are specified herein or indicated on the Drawings for future installation, space shall be provided in the control console and the equipment racks, and on the control panels.
- B. Provide ventilation according to equipment manufacturer's recommendations.
- C. Provide unused equipment enclosure panel space with blank or ventilating panels.
- D. Mount an AC enclosure wiring diagram in each enclosure with the following information:
 1. The number of AC power circuits within the enclosure.
 2. A schematic diagram showing the incoming AC circuits and the location and quantity of outlets fed by each circuit.
 3. The current capacity of each circuit.
 4. The location of the breaker panel and the number of various breakers.
 5. Indicate that the enclosure and equipment are on an isolated ground system (if applicable).

3.3 FIBER OPTIC TRANSMISSION AND SIGNAL EQUIPMENT

- A. Bond fiber optic enclosures, exposed building steel, cabinets, service boxes, and framework to the building grounding system in accordance with TIA/J-STD-607-D-2019 and local codes.

3.4 IDENTIFICATION

- A. General:
 1. Identification shall consist of upper-case letters.

2. Where identification is applied to surfaces which require a finish, identification shall be installed after the surface has been finished.

B. Equipment:

1. Provide and install engraved labels for each item rack-mounted equipment.
2. Except where otherwise specified herein, label switches, controls, and receptacles. Labeling material shall be engraved plastic laminate or metal plates. Labels shall be placed on coverplates or directly adjacent to switches, controls, and receptacles to facilitate service and replacement.
3. Signs shall not interfere with the operation and maintenance of equipment. Attach signs with rustproof screws.

3.5 EQUIPMENT AND EQUIPMENT ROOMS

- A. Remove dust, dirt, rust, stains, and temporary covers.
- B. Foreign matter shall be blown, vacuumed, or cleaned out of and from new equipment, devices, switches, controls, and panels.
- C. Clean and polish identification plates.
- D. In equipment rooms, clean equipment, conduit, and room surfaces from dust and dirt and maintain in a clean condition from date of substantial completion until final completion of work and corrective work.
- E. Remove excess material from the Project site.

3.6 SEISMIC AND WIND RESTRAINTS

- A. Restraints shall be installed after the equipment is mounted, connected, and operating to ensure that no contact occurs during normal equipment operation.
- B. Installation of seismic restraints shall not cause any change of position of equipment, or raceways resulting in stress and misalignment.
- C. No rigid connections between equipment, conduit, or raceways and the building structure shall be made that degrade the vibration isolated system specified herein.
- D. Do not brace a system to two different structures, such as a wall and a ceiling.
- E. After installation, the manufacturer shall verify that seismic and wind restraints are installed and operating properly and shall submit a certificate so stating.

3.7 GROUNDING AND SURGE SUPPRESSION

- A. Equipment shall be grounded as specified herein, and in accordance with the equipment supplier's recommendations.
- B. A single primary specialty system ground shall be established for the specialty systems in each area as follows:

1. In each enclosure install a copper bus bar mounted to the enclosure to act as the ground unipoint for the connection of ground conductors used within that enclosure.
 2. A single #6 AWG insulated grounding conductor from each enclosure shall be run back to the ground bus bar located in the telecom room.
- C. Surge Protective Device Grounding:
1. Connect each surge protective device to the local ground bus in the terminal cabinet with wiring sized as recommended by the manufacturer.
 2. Coordinate to ensure that the 120 V AC power source/supply suppressor is also grounded to the same local ground bus as surge protective devices provided in this Section for the same system.
- D. Surge Protective Devices (SPDs):
1. Install SPDs on low voltage signal or communications conductors entering the building from exterior locations, including those conductors from devices mounted on the exterior of the building.
 2. Provide AC power SPDs on microprocessor-based specialty system rack-mounted equipment.

3.8 AC POWER AND POWER SUPPLY EQUIPMENT

- A. Provide power connections from existing panels to specialty equipment.
- B. Components connected to power supplies shall be connected to individually fused or PTC outputs.
- C. Components specified below shall be provided with battery back-up:
1. Card access readers, reader interface devices, electric lock power supplies, and control panels.
 2. Intrusion detection system panels and components.
 3. Cellular alarm transmission back-up system.
 4. Perimeter intrusion detection system panels and components.
- D. Components specified below shall be connected in their respective locations to the UPS provided under this section:
1. Equipment and devices located in security equipment racks in the Data Center and Security Control Room.
 2. Servers: Access Control System (ACS) servers, Network Video Recorders (NVRs), or Video Surveillance System (VSS) servers and storage media].
 3. Security System Workstations.
 4. Storage: Direct Attached Storage (DAS), Network Attached Storage (NAS), and Storage Area Networks used for ACS or VSS storage].
 5. Communications components: rack mounted fiber optic transmission system components and security network switches.

3.9 MISCELLANEOUS EQUIPMENT

- A. Permanently identify with metal tags.
- B. Turn over keys, along with manufacturer's certificate stating the quantity of each key made, to the Owner and obtain a signed receipt acknowledging receipt of same.

3.10 OPERATION AND MAINTENANCE DOCUMENTATION PACKAGE

- A. These operation and maintenance manual requirements supplement operation and maintenance manual documentation requirements of other Sections of these specifications.
- B. Operation and maintenance documentation, in hardback 3-ring loose-leaf binders except full size drawings and CDs, shall cover the specialty systems.
- C. The operation and maintenance documentation package shall be submitted as one comprehensive package to the Owner 3 weeks before systems acceptance testing, and shall be updated, revised, and completed during, and at completion of, performance verification.
- D. Documentation shall be type written and shall contain, at a minimum, the following information.
 - 1. Contact Information: Contractor's emergency contact information during the warranty period.
 - 2. Operating Manual: Provide manufacturers' supplied user, programming, maintenance, and trouble-shooting manuals.
 - 3. Copies of software configuration files and/or programming files, as applicable, on USB drives.
 - 4. Test Reports and Certifications.
 - 5. Construction Documents:
 - a) As-built drawings (shop drawings updated to reflect field installed conditions). This should include cable numbers, controller designations, wiring diagrams, etc.
 - b) Approved submittals.
- E. An electronic copy of Construction Documents shall be included within each operation and maintenance binder. Close-out materials provided in electronic format shall include As-built drawings, approved submittals, warranty certificates, and test reports.
- F. Submit a receipt signed by the Owner acknowledging receipt of the operation and maintenance documentation package.

3.11 RECORD DRAWINGS

- A. A record of field and as-installed conditions shall be maintained at the site, shall be kept current throughout the Project, and shall be used in the preparation of the final record drawings. Field and as-installed conditions shall be recorded on design drawings and shall be marked to indicate addenda, change orders, field changes and selections made during construction.

- B. Upon completion of the Project, submit marked-up design drawings indicating field and as-installed conditions, and shop drawings incorporating changes made during construction for wiring and equipment. Submit the following:
 - 1. 3 set(s) of bound prints.
 - 2. Full size PDFs on USB drive
 - 3. AutoCAD DWG files used to prepare record drawings and shop drawings on USB drive.

3.12 MAINTENANCE

- A. Equipment operated prior to the date of substantial completion shall be maintained in accordance with manufacturers' recommendations.

3.13 INSTRUCTION OF OPERATING PERSONNEL

- A. Conduct formal instruction sessions for operating personnel. Conduct 2 similar sessions. The first session shall be conducted at the time of start-up and check-out, and the second session shall be approximately 2 months later. Sessions shall be conducted at the site.
- B. Prepare and submit a syllabus describing an overview of the program, describing how the program will be conducted, when and where meetings are to be held, names and company affiliations of lecturers, description of contents and outline for each lecture, and recommended reference material and outside reading. Obtain direction from the Owner on which operating personnel shall be instructed in each system.
- C. Sessions shall include:
 - 1. General familiarization and operating procedures for each specialty systems installation.
 - 2. Routine maintenance procedures for equipment.
 - 3. User level programming of programmable systems.
- D. Factory-trained technicians shall give operating and maintenance instructions on the specialty systems and equipment.
- E. Provide video of training sessions and a complete record copy of training materials, handouts, and other printed materials used in each training session. Obtain receipt from the Owner acknowledging completion of each item of instruction.

END OF SECTION 28050