

SECTION 281353 – METAL DETECTOR AND X-RAY INSPECTION SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 DESCRIPTION

- A. General: This Section includes all labor, materials, tools, equipment and services for the complete installation of walk-through security metal detectors and x-ray scanners.
- B. Related Work:
 - 1. Intrusion Detection; Section 281600.
 - 2. Video Surveillance System: Section 282300.

1.3 SUBMITTALS QUALITY ASSURANCE

- A. Project Data: Description of system operation indicating purpose and capabilities of each component of system with functional system diagram indicating all interfaces to other systems. Description shall include, and call attention to, all variances from the Contract Documents.
- B. Shop Drawings: Complete installation drawings including system diagrams and terminal point to terminal point wiring diagrams or schedules.
- C. Product Data: Technical data sheets and specifications for each and every component.
- D. Testing: Test reports of network cable installation.

1.4 WARRANTY (See Division 1)

PART 2 - PRODUCTS

2.1 SECURITY METAL DETECTOR

- A. Security metal detector shall be a microprocessor based programmable walk-through portal type of metal detector with low-error, high throughput design to sense and indicate the presence of metal concealed on a person or in a non-metallic container. Unit shall be in the form of a knock-down archway with a processor console.

1. Weight: The unit shall weigh no less than 200 pounds.
2. Dimensions: The unit's external dimensions shall not exceed 26 inches deep, 32 inches wide and 88 inches high. Internal passageway dimensions shall not exceed 28.5 inches wide.
3. Zone Indicator Lights: The unit receiver leg shall include a threat location indicator light bar extending the full length of the leg on the front and back of the leg. Zone indicator light bar shall include a minimum of 20 indicator lights.
4. No manual balancing or site calibration shall be required except for those functions associated with the actual detection applications, i.e. sensitivity, program or volume.
5. Through-put rate shall be from 50 people per minute for hand gun detection to 5 people per minute where all metal is detected, i.e. high security applications.
6. The unit shall offer 100 different sensitivity levels. The unit shall be preset to the standard FAA weapons detection program and this program setting cannot be altered by the user.
7. The unit shall meet all requirements of the NIJ601.02 (documentation required).
8. A dual unit electronics console shall be mounted in the overhead support of the archway.

2.3 X-RAY SCANNER

- A. X-RAY Scanner shall be a computer based programmable conveyor type using dual energy X-Ray image technology to display the organic and inorganic objects within a non-metallic container. Provide unit with display terminals and metal support structures to allow ergonomic operation of equipment.
- B. The X-Ray Screening System specified herein shall provide a means to inspect the belongings of any person entering the facility to insure that no weapons are being transported into a secured area.
- C. Physical Characteristics:
 1. Weight: The unit shall not weigh more than 750 pounds.
 2. Width: The unit shall not be more than 31.5 inches in width.
 3. Length: The conveyor length shall be no less than 68 inches.
 4. Height: The unit shall not exceed 46.5 inches in height.
 5. Minimum Parcel Opening: The parcel opening shall be a minimum of 24 inches wide by 16.5 inches high.
- D. Design Characteristics:
 1. Generator: Design shall be hermetically sealed oil-bath equipped with internal bellow expansion module with no oil breathing tube or tank. 140kV operational power.
 2. Detection System: The unit detector design shall be "L" shaped dual multi-element, solid state photodiodes with each element individually amplified and multiplexed. No parcel corner cuts are allowed, and no object in the tunnel shall be missed.
 3. Photographic Film Safety: The unit shall be safe for International Standards Association (ISO) 1600 photographic film.
 4. X-Ray Voltage and Cooling: The X-ray unit shall be 140 kilovolt anode voltage. No warm-up period shall be required.

5. Unit Operation: The unit's control panel and monitor shall allow for positioning on the top of the unit or at any of the four corners. At the corner locations, the control panel and monitor's height shall be adjustable via an electronic motor. Control buttons shall be raised for ease of use. All control buttons shall be fully user programmable and the following standard features shall be accessible through single button access without requiring the operator to stop the conveyor belt. Zoom 2x and 4X, Variable Gamma, Pseudo Color, Hi-Penetration, Automatic Threat Alert, Edge Trace, Organic Stripping and Inorganic Stripping. Organic and Inorganic Stripping functions shall each have their own preprogrammed activation buttons. No resetting of the system shall be required after activation of any of the system's imaging options.
6. Radiation Dosage Rates: The radiation dose rate of the unit shall not exceed 0.16 mR per inspection.
7. Power Requirements: 105-125 VAC, 60Hz (15 amp max.). Provide internal UPS unit (mounted in the X-ray cabinet) to power X-ray. The UPS battery shall be sized to work on stand-by power for a minimum of 20 minutes.
8. Operating System: All imaging functions shall be achieved via a PC-based operating system; Linux-based preferred. Minimum requirements: 800 MHz (Pentium 3 or equivalent, 256 Meg RAM, 40 Gigabyte hard drive, Zip drive, Ethernet Card).
9. Upgradeability: The unit's imaging software shall be computer-based and shall be upgradeable to future revisions via CD-ROM without the need for any hardware modifications.
10. Network Capability: The unit shall be fully network-ready via a LAN fast Ethernet IEEE 802.3u. The unit shall be connected to Owner's existing network for the alarm's monitoring.
11. Provide a 3 foot entry roller table and 6 foot roller table at the exit.

E. Imaging:

1. Resolution: The unit shall be capable of imaging 39 American Wire Gage (AWG) solid copper wire at the fifth step of an American Society of Testing Materials (ASTM) stepwedge for the entire life of the machine. The numbers on the stepwedge shall be easily readable at all levels.
2. Penetration: The unit shall penetrate 30 millimeters of steel.
3. Solid State Technology: The unit shall be state-of-the-art line-scan type technology and have a memory capacity of 1280 x 1024 x 24 bits, 4096 gray levels. It shall also have a contrast sensitivity of at least 22 gray levels visible as measured with an ASTM stepwedge.
4. Organic and Inorganic Identification: The unit shall be one 17 inch monitor with a second 17 inch monitor optional. Both configurations shall allow black and white density-based image analysis and image processing capability by means of four color assignments, enabling the operator to distinguish between organic and inorganic material. After identifying a material as organic (orange) or inorganic (blue), the unit shall color the item according to density, i.e. the more dense the item the darker the color.
5. Organic and Inorganic Stripping Capability: The unit shall be capable of allowing the operator to strip from the screen any organic or inorganic information by means of a single button without stopping the conveyor belt, leaving only the important organic or inorganic information highlighting the potential threat areas.

6. Semi-Automatic Explosive Detection: The system shall include an operator-activated function to highlight items that represent potential explosives, i.e. those items with unusually high concentrations of atomic numbers 6, 7 and 8.
7. Real-Time Operation: All features shall be accessible to the operator without having to stop the conveyor belt.
8. Zoom Function: The keyboard shall allow up to 16x zooming via a Panning Zoom Pad without the use of a mouse or trackball. The screen image shall include a Zoom Position Locator Box which identifies the area of the bag currently being magnified.
9. Store Image Review: The unit shall store the previous 10 images for review without having to reverse the belt or rescan the item.
10. Automatic Dense Area Detection: The unit shall automatically detect sections of the image of high absorption, i.e. dense and dark, and lighten and enhance only these selected areas with no change to the surrounding image.
11. Image archiving and Retrieval: The unit shall include a USB port on the outside of the unit's housing, i.e. accessible without opening the unit's housing. Stored files shall be exportable to a USB thumb drive for review and printing at a desktop PC. File conversion software shall be provided to convert proprietary files to a TIF format.

PART 3 – EXECUTION

3.1 INSTALLATION

- A. Comply with manufacturer's installation requirements.
- B. Entry and Exit Tables: The X-rays units shall include a 3 foot entry roller table and a 6 foot exit roller table.

3.2 OWNER PERSONNEL TRAINING:

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operation and maintain the metal detector and x-ray inspection system.

END OF SECTION 281353

SECTION 281600 – INTRUSION DETECTION

PART 1 - GENERAL

1.1 RELATED DOCUMENT SUMMARY

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

1.2 SUMMARY

A. This Section includes the following:

1. Intrusion detection with multiplexed, modular, microprocessor-based controls, intrusion sensors and detection devices, and communication links to perform monitoring, alarm, and control functions.
2. Intrusion detection system shall be integrated with door hardware and other building alarm systems.

1.3 DEFINITIONS

- A. Protected or Protection Zone: A space or area for which an intrusion must be detected and uniquely identified, the sensor or group of sensors assigned to perform the detection, and any interface equipment between sensors and communication link to central-station control unit.
- B. Standard Intruder: A person who weighs 125 lbs. or less and whose height is 60 inches or less; dressed in a long-sleeved shirt, slacks, and shoes.
- C. Standard Intruder Movement: Any movement, such a walking, running, crawling, rolling, or jumping, of a “standard intruder” in a protected zone.

1.4 SUBMITTALS

- A. Product Data: Components for sensing, detecting, and control, including dimensions and data on features, performances, electrical characteristics, ratings, and finishes.
- B. Shop Drawings: Detail of standard components that are custom assembled for specific application.

1. Functional Block Diagram: Show single-line interconnections between components including interconnections between components specified in this Section and those furnished under other Sections. Indicate methods used to achieve systems integration. Indicate control, signal, and data communication paths and identify control interface devices and media to be used. Describe characteristics of network and other data communication lines.
 2. Site and Floor Plans: Indicate final outlet and device locations, routing of raceways, and cables inside and outside the building.
 3. System Wiring Diagrams: Include system diagrams unique to Project. Show connections for all devices, components, and auxiliary equipment. Include diagrams for equipment and for system with all terminals and interconnections identified.
 4. Sensor detection patters and adjustment ranges.
- C. Equipment and System Operation Description: Include method of operation and supervision of each component and each type of circuit.
- D. Qualification Data: For Installer.
- E. Field quality control test reports.
- F. Operation and Maintenance Data: For intrusion detection system to include emergency, operation, and maintenance manuals. In addition to items specified in Division 01 Section "Operation and Maintenance Data," include the following:
1. Data for each type of product, including features and operating sequences, both automatic and manual.
 2. Central station control unit hardware and software data.
- G. Warranty: Special warranty specified in this Section.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications:
1. An employer of workers, at least one of whom is a technician certified by the National Burglar & Fire Alarm Association.
 2. Manufacturer's authorized representative who is trained and approved for installation of units required for this Project.
- B. Intrusion Detection Systems Integrator Qualifications: An experienced intrusion detection equipment supplier and Installer who has completed systems integration work for installations similar in material, design, and extent to that indicated for this Project, who work has resulted in construction with a record of successful in-service performance.
- C. Testing Agency Qualifications: An independent testing agency, with the experience and capability to conduct the testing indicated, that is a member company of the National Burglar & Fire Alarm Association, or is a nationally recognized testing laboratory (NRTL) as defined by OSHA in 29 CFR 1019.7.

1. Testing Agency's Field Supervisor: Person currently certified as an advanced alarm technician by the National Burglar & Fire Alarm Association to supervise on-site testing specified in Part 3.
- D. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- E. Comply with NFPA 70.

1.6 WARRANTY

- A. Warranty: Manufacturer's standard form in which manufacturer and Installer agree to repair or replace components of intrusion detection devices and equipment that fail in materials or workmanship within specified warranty period.
 1. Warranty Period: Two years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements.

2.2 DESCRIPTION OF SYSTEM

- A. Provide a complete intrusion detection system consisting of the following components as required by the project.
 1. System control station
 2. Door and window access switches
 3. PIR sensors
 4. Microwave detectors
 5. Acoustic sensors
 6. Annunciator panel
 7. Audible and visual alarm devices

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of intrusion detection.

1. Examine roughing-in for embedded and built-in anchors to verify actual locations of intrusion detection connections before intrusion detection installation.
 2. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of intrusion detection.
- B. Inspect built-in and cast-in anchor installations before installing intrusion detection, to verify that anchor installations comply with requirements. Prepare inspection reports.
1. Remove and replace anchors where inspections indicate that they do not comply with requirements. Reinspect after repairs or replacements are made.
 2. Perform additional inspections to determine compliance of replaced or additional anchor installations. Prepare inspection reports.
- C. For material whose orientation is critical for its performance as a ballistic barrier, verify installation orientation.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 SYSTEM INSTALLATION

- A. Comply with UL 681 and UL 1641.
- B. Security Fasteners: Where accessible to inmates, install intrusion detection components using security fasteners with head style appropriate for fabrication requirements, strength, and finish of adjacent materials except that a maximum of two different sets of tools shall be required to operate security fasteners for Project.

3.3 WIRING INSTALLATION

- A. Wiring Method: Comply with the owner's requirements.
- B. Wires and Cables:
1. Conductors: Size as recommended in writing by system manufacturer, unless otherwise indicated.
 2. 120-V Power Wiring: Install according to "Low-Voltage Electrical Power Conductors and Cables," unless otherwise indicated.
- C. Splices, Taps, and Terminations: Make connections only on numbered terminal strips in junction, pull, and outlet boxes; terminal cabinets; and equipment enclosures.
- D. Install power supplies and other auxiliary components for detection devices at controllers, unless otherwise indicated or required by manufacturer. Do not install such items near devices they serve.
- E. Identify components with engraved, laminated-plastic or metal nameplate for central station control unit and each terminal cabinet, mounted with corrosion-resistant screws. Nameplates and label products are specified in Division 26 Section, "Identification for Electrical Systems."

3.4 GROUNDING

- A. Ground system components and conductor and cable shields to eliminate shock hazard and to minimize ground loops, common-mode returns, noise pickup, cross talk, and other impairments.
- B. Signal Ground Terminal: Locate at main equipment rack or cabinet. Isolate from power system and equipment grounding. Provide 5-ohm ground. Measure, record, and report ground resistance.
- C. Install grounding electrodes of type, size, location, and quantity indicated. Comply with installation requirements in Division 26 Section, "Grounding and Bonding for Electrical Systems."

3.5 FIELD QUALITY CONTROL

- A. Pretesting: After installation, align, adjust, and balance system and perform complete pretesting to determine compliance of system with requirements in the Contract Documents. Correct deficiencies observed in pretesting. Replace malfunctioning or damaged items with new ones and retest until satisfactory performance and conditions are achieved. Prepare forms for systematic recording of acceptance test results.
 - 1. Report of Pretesting: After pretesting is complete, provide a letter certifying that installation is complete and fully operable; include names and titles of witnesses to preliminary tests.
- B. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust field-assembled components and equipment installation. Report results in writing.
- C. Perform the following field tests and inspections and prepare reports:
 - 1. Inspection: Verify that units and controls are properly labeled and interconnecting wires and terminals are identified.
 - 2. Operational Tests: Schedule tests after pretesting has been successfully completed. Test all modes of system operation and intrusion detection at each detection device. Test for detection of intrusion and for false alarms in each protected zone. Test for false alarms by simulating activities outside indicated detection patterns.
 - 3. Electrical Tests: Comply with NFPA 72, Section A-7. Minimum required tests are as follows:
 - a. Verify the absence of unwanted voltages between circuit conductors and ground.
 - b. Test all conductors for short circuits using an insulation-testing device.
 - c. With each circuit pair, short circuit at the far end of circuit and measure circuit resistance with an ohmmeter. Record circuit resistance of each circuit on Record Drawings.
 - d. Verify that each controller is in normal condition as detailed in manufacturer's operation and maintenance manual.

- e. Test signal and data transmission circuits complying with requirements in Division 28 Section “Conductors and Cables for Electronic Safety and Security” for proper signal transmission under open-circuit conditions. One connection each should be opened at not less than 10 percent of initiating and indicating devices. Observe proper signal transmission according to class of wiring used.
 - f. Verify that transient surge-protection devices are installed according to manufacturer’s written instructions.
 - g. Test each initiating and indicating device for alarm operation and proper response at central-station control unit.
 - h. Test both primary and secondary power. Verify, by test, that UPS is capable of operating the system for period and in manner specified.
- D. Report of Tests and Inspections: Prepare a written record of tests, inspections, and detailed test results in the form of a test log.
- E. Tag all equipment, stations, and other components for which tests have been satisfactorily completed.

3.6 DEMONSTRATION

- A. Engage in a factory-authorized service representative to train Owner’s maintenance personnel to adjust, operate, and maintain intrusion detection. Refer to Division 01 Section “Demonstration and Training.”

3.7 ADJUSTING

- A. Occupancy Adjustments: When requested within 12 months of Substantial Completion, provide on-site assistance in adjusting system to suit actual occupied conditions. Provide up to three visits to Project during other than normal occupancy hours for this purpose.

END OF SECTION 281600

SECTION 282300 - VIDEO SURVEILLANCE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes a video surveillance system consisting of cameras, digital video recorder, data transmission wiring, and a control station with its associated equipment.
- B. Video surveillance system shall be integrated with monitoring and control system specified in Section 281600 "Intrusion Detection," and Section 281300 "Access Control," which specifies systems integration.

1.3 DEFINITIONS

- A. AGC: Automatic gain control.
- B. BNC: Bayonet Neill-Concelman - type of connector.
- C. B/W: Black and white.
- D. CCD: Charge-coupled device.
- E. FTP: File transfer protocol.
- F. IP: Internet protocol.
- G. LAN: Local area network.
- H. MPEG: Moving picture experts group.
- I. NTSC: National Television System Committee.
- J. PC: Personal computer.
- K. PTZ: Pan-tilt-zoom.
- L. RAID: Redundant array of independent disks.

- M. TCP: Transmission control protocol - connects hosts on the Internet.
- N. UPS: Uninterruptible power supply.
- O. WAN: Wide area network.

1.4 PERFORMANCE REQUIREMENTS

- A. Seismic Performance: Video surveillance system shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.
 - 1. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified and the unit will be fully operational after the seismic event."

1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated. Include dimensions and data on features, performance, electrical characteristics, ratings, and finishes.
- B. Shop Drawings: For video surveillance. Include plans, elevations, sections, details, and attachments to other work.
 - 1. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
 - 2. Functional Block Diagram: Show single-line interconnections between components for signal transmission and control. Show cable types and sizes.
 - 3. Dimensioned plan and elevations of equipment racks, control panels, and consoles. Show access and workspace requirements.
 - 4. UPS: Sizing calculations.
 - 5. Wiring Diagrams: For power, signal, and control wiring.
- C. Equipment List: Include every piece of equipment by model number, manufacturer, serial number, location, and date of original installation. Add pretesting record of each piece of equipment, listing name of person testing, date of test, set points of adjustments, name and description of the view of preset positions, description of alarms, and description of unit output responses to an alarm.

1.6 INFORMATIONAL SUBMITTALS

- A. Seismic Qualification Certificates: For video surveillance, cameras, camera-supporting equipment, accessories, and components, from manufacturer.
 - 1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.

2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

B. Field quality-control reports.

C. Warranty: Sample of special warranty.

1.7 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For cameras, power supplies, infrared illuminators, monitors, videotape recorders, digital video recorders, video switches, and control-station components to include in emergency, operation, and maintenance manuals. In addition to items specified in Section 017823 "Operation and Maintenance Data," include the following:

1. Lists of spare parts and replacement components recommended to be stored at the site for ready access.

1.8 QUALITY ASSURANCE

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

B. Comply with NECA 1.

C. Comply with NFPA 70.

D. Electronic data exchange between video surveillance system with an access-control system shall comply with SIA TVAC.

1.9 PROJECT CONDITIONS

A. Environmental Conditions: Capable of withstanding the following environmental conditions without mechanical or electrical damage or degradation of operating capability:

1. Control Station: Rated for continuous operation in ambient temperatures of 60 to 85 deg F and a relative humidity of 20 to 80 percent, noncondensing.
2. Interior, Controlled Environment: System components, except central-station control unit, installed in air-conditioned or temperature-controlled interior environments shall be rated for continuous operation in ambient temperatures of 36 to 122 deg F dry bulb and 20 to 90 percent relative humidity, noncondensing. Use NEMA 250, Type 1 enclosures.
3. Interior, Uncontrolled Environment: System components installed in non-air-conditioned or temperature-controlled interior environments shall be rated for continuous operation in ambient temperatures of 0 to 122 deg F dry bulb and 20 to 90 percent relative humidity, noncondensing. Use NEMA 250, Type 3R, Type 4, Type 12 or Type 12K enclosures.

4. Exterior Environment: System components installed in locations exposed to weather shall be rated for continuous operation in ambient temperatures of minus 30 to plus 122 deg F dry bulb and 20 to 90 percent relative humidity, condensing. Rate for continuous operation when exposed to rain as specified in NEMA 250, winds up to 85 mph and snow cover up to 24 inches thick. Use NEMA 250, Type 3, Type 3R, Type 3S, Type 4 or Type 4X enclosures.
5. Hazardous Environment: System components located in areas where fire or explosion hazards may exist because of flammable gases or vapors, flammable liquids, combustible dust, or ignitable fibers shall be rated, listed, and installed according to NFPA 70.
6. Corrosive Environment: System components subject to corrosive fumes, vapors, and wind-driven salt spray in coastal zones. Use NEMA 250, Type 4X or Type 6P enclosures.
7. Security Environment: Camera housing for use in high-risk areas where surveillance equipment may be subject to physical violence.

1.10 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of cameras, equipment related to camera operation, and control-station equipment that fail in materials or workmanship within specified warranty period.
 1. Warranty Period: Three years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 SYSTEM REQUIREMENTS

- A. Video-signal format shall comply with NTSC standard, composite interlaced video. Composite video-signal termination shall be 75 ohms.
- B. Surge Protection: Protect components from voltage surges originating external to equipment housing and entering through power, communication, signal, control, or sensing leads. Include surge protection for external wiring of each conductor's entry connection to components.
 1. Minimum Protection for Power Connections 120 V and More: Auxiliary panel suppressors complying with requirements in Section 264313 "Surge Protection for Low-Voltage Electrical Power Circuits."
 2. Minimum Protection for Communication, Signal, Control, and Low-Voltage Power Connections: Comply with requirements in Section 264313 "Surge Protection for Low-Voltage Electrical Power Circuits" as recommended by manufacturer for type of line being protected.
- C. Tamper Protection: Tamper switches on enclosures, control units, pull boxes, junction boxes, cabinets, and other system components shall initiate a tamper-alarm signal when unit is opened or partially disassembled. Control-station, control-unit alarm display shall identify tamper alarms and indicate locations.

2.2 STANDARD CAMERAS

- A. Manufacturers: Subject to compliance with requirements.
- B. B/W Camera:
 - 1. Comply with UL 639.
 - 2. Pickup Device: CCD interline transfer, 252,000 512(H) by 492(V) pixels.
 - 3. Horizontal Resolution: 380 lines.
 - 4. Signal-to-Noise Ratio: Not less than 46 dB.
 - 5. With AGC, manually selectable on or off.
 - 6. Sensitivity: Camera shall provide usable images in low-light conditions, delivering an image at a scene illumination of lux, as specified, at f/1.4, with camera AGC off.
 - 7. Sensitivity: Camera shall deliver 1-V peak-to-peak video signal at the minimum specified light level. Illumination for the test shall be with lamps rated at approximately 2200-K color temperature, and with camera AGC off.
 - 8. Manually selectable modes for backlight compensation or normal lighting.
 - 9. Scanning Synchronization: Determined by external synch over the coaxial cable. Camera shall revert to internally generated synchronization on loss of external synch signal.
 - 10. Motion Detector: Built-in digital.
- C. Color Camera:
 - 1. Comply with UL 639.
 - 2. Pickup Device: CCD interline transfer, 380,000 771(H) by 492(V) pixels.
 - 3. Horizontal Resolution: 480 lines.
 - 4. Signal-to-Noise Ratio: Not less than 50 dB, with camera AGC off.
 - 5. With AGC, manually selectable on or off.
 - 6. Sensitivity: Camera shall provide usable images in low-light conditions, delivering an image at a scene illumination of lux, as required, and stop when specified, with camera AGC off.
 - 7. Sensitivity: Camera shall deliver 1-V peak-to-peak video signal at the minimum specified light level. Illumination for the test shall be with lamps rated at approximately 2200-K color temperature, and with camera AGC off.
 - 8. Manually selectable modes for backlight compensation or normal lighting.
 - 9. Scanning Synchronization: Determined by external synch over the coaxial cable. Camera shall revert to internally generated synchronization on loss of external synch signal.
 - 10. White Balance: Auto-tracing white balance, with manually settable fixed balance option.
 - 11. Motion Detector: Built-in digital.
- D. Automatic Color Dome Camera: Assembled and tested as a manufactured unit, containing dome assembly, color camera, motorized pan and tilt, zoom lens, and receiver/driver.
 - 1. Comply with UL 639.
 - 2. Pickup Device: CCD interline transfer, 380,000 768(H) by 494(V) pixels.
 - 3. Horizontal Resolution: 480 lines.
 - 4. Signal-to-Noise Ratio: Not less than 50 dB, with camera AGC off.
 - 5. With AGC, manually selectable on or off.

6. Sensitivity: Camera shall provide usable images in low-light conditions, delivering an image at a scene illumination of lux at (as required) Insert f-stop of lens (f stop specified), with camera AGC off.
7. Sensitivity: Camera shall deliver 1-V peak-to-peak video signal at the minimum specified light level. Illumination for the test shall be with lamps rated at approximately 2200-K color temperature, and with camera AGC off.
8. Manually selectable modes for backlight compensation or normal lighting.
9. Pan and Tilt: Direct-drive motor, 360-degree rotation angle, and 180-degree tilt angle. Pan-and-tilt speed shall be controlled by operator. Movement from preset positions shall be not less than 300 degrees per second.
10. Preset Positioning: Eight user-definable scenes, each allowing 16-character titles. Controls shall include the following:
 - a. In "sequence mode," camera shall continuously sequence through preset positions, with dwell time and sequencing under operator control.
 - b. Motion detection shall be available at each camera position.
 - c. Up to four preset positions may be selected to be activated by an alarm. Each of the alarm positions may be programmed to output a response signal.
11. Scanning Synchronization: Determined by external synch over the coaxial cable. Camera shall revert to internally generated synchronization on loss of external synch signal.
12. White Balance: Auto-tracing white balance, with manually settable fixed balance option.
13. Motion Detector: Built-in digital.
14. Dome shall support multiplexed control communications using coaxial cable recommended by manufacturer.

2.3 REINFORCED DOME CAMERAS

- A. Manufacturers: Subject to compliance with requirements.
- B. Camera: Designed for high-abuse locations, with a weathertight semi-recessed or surface mounting, impact-resistance polycarbonate dome, and heavy-gage, 6061 T6 aluminum body.
 1. Suitable for exterior environment, rated for continuous operation in ambient temperatures of minus 40 to plus 122 deg F dry bulb and up to 85 percent relative humidity.
 2. Pickup Device: CCD interline transfer, 290,000 510(H) by 492(V) pixels.
 3. Horizontal Resolution: 350 lines.
 4. Signal-to-Noise Ratio: Not less than 46 dB.
 5. With AGC and automatic backlight compensation.
 6. Sensitivity: Camera shall provide usable images in low-light conditions, delivering an image at a scene illumination of 6 lux at f/2.0.
 7. Scanning Synchronization: Determined by external synch over the coaxial cable. Camera shall revert to internally generated synchronization on loss of external synch signal.
 8. White Balance: Auto-tracing white balance.

2.4 LENSES

- A. Manufacturers: Subject to compliance with requirements.
- B. Description: Optical-quality coated lens, designed specifically for video-surveillance applications and matched to specified camera. Provide color-corrected lenses with color cameras.
 - 1. Auto-Iris Lens: Electrically controlled iris with circuit set to maintain a constant video level in varying lighting conditions.
 - 2. Fixed Lens: With calibrated focus ring.
 - 3. Zoom Lens: Motorized, remote-controlled unit, rated as "quiet operating." Features include the following:
 - a. Electrical Leads: Filtered to minimize video signal interference.
 - b. Motor Speed: Variable.
 - c. Lens shall be available with preset positioning capability to recall the position of specific scenes.

2.5 POWER SUPPLIES

- A. Low-voltage power supplies matched for voltage and current requirements of cameras and accessories, and of type as recommended by manufacturer of camera, infrared illuminator, and lens.
 - 1. Enclosure: NEMA 250, Type 1, Type 3 or Type 4X.

2.6 CAMERA-SUPPORTING EQUIPMENT

- A. Manufacturers: Subject to compliance with requirements.
- B. Minimum Load Rating: Rated for load in excess of the total weight supported times a minimum safety factor of two.
- C. Pan Units: Motorized automatic-scanning units arranged to provide remote-controlled manual and automatic camera panning action, and equipped with matching mounting brackets.
 - 1. Scanning Operation: Silent, smooth, and positive.
 - 2. Stops: Adjustable without disassembly, to limit the scanning arc.
- D. Pan-and-Tilt Units: Motorized units arranged to provide remote-controlled aiming of cameras with smooth and silent operation, and equipped with matching mounting brackets.
 - 1. Panning Rotation: 0 to 355 degrees, with adjustable stops.
 - 2. Tilt Movement: 90 degrees, plus or minus 5 degrees, with adjustable stops.
 - 3. Speed: 12 degrees per second in both horizontal and vertical planes.
 - 4. Wiring: Factory prewired for camera and zoom lens functions and pan-and-tilt power and control.

5. Built-in encoders or potentiometers for position feedback, and thermostat-controlled heater.
 6. Pan-and-tilt unit shall be available with preset positioning capability to recall the position of a specific scene.
- E. Mounting Brackets for Fixed Cameras: Type matched to items supported and mounting conditions. Include manual pan-and-tilt adjustment.
- F. Protective Housings for Fixed and Movable Cameras: Steel or 6061 T6 aluminum enclosures with internal camera mounting and connecting provisions that are matched to camera/lens combination and mounting and installing arrangement of camera to be housed.
1. Tamper switch on access cover sounds an alarm signal when unit is opened or partially disassembled. Central-control unit shall identify tamper alarms and indicate location in alarm display. Tamper switches and central-control unit are specified in Section 281600 "Intrusion Detection."
 2. Camera Viewing Window: Polycarbonate or Lexan window, aligned with camera lens.
 3. Duplex Receptacle: Internally mounted.
 4. Alignment Provisions: Camera mounting shall provide for field aiming of camera and permit removal and reinstallation of camera lens without disturbing camera alignment.
 5. Built-in, thermostat-activated heater and blower units. Units shall be automatically controlled so the environmental limits of the camera equipment are not exceeded.
 6. Sun shield shall not interfere with normal airflow around the housing.
 7. Mounting bracket and hardware for wall or ceiling mounting of the housing. Bracket shall be of same material as the housing; mounting hardware shall be stainless steel.
 8. Finish: Housing and mounting bracket shall be factory finished using manufacturer's standard finishing process suitable for the environment.
 9. Enclosure Rating: (Insert NEMA Type designation) (Insert Ingress Protection code designation).

2.7 MONITORS

- A. Manufacturers: Subject to compliance with requirements.
- B. Color:
1. Metal cabinet units designed for continuous operation.
 2. Screen Size (Diagonal Dimension): As specified
 3. Horizontal Resolution: 300 lines.
 4. Minimum Front Panel Devices and Controls: Power switch; power-on indicator; and brightness, contrast, color, and tint controls.
 5. Degaussing: Automatic.
 6. Mounting: Single, 14-inch or Dual, 9-inch, vertical, EIA 19-inch electronic equipment rack or cabinet complying with CEA 310-E.
 7. Electrical: 120-V ac, 60 Hz.

2.8 VIDEOTAPE RECORDERS

- A. Manufacturers: Subject to compliance with requirements.
- B. Description: Industrial, time-lapse type recorder, designed for continuous operation. Tape format is 1/2 inch using industrial-grade, T-120 cassettes.
 - 1. Horizontal Resolution: 400 lines, minimum.
 - 2. Recording Heads: Rotary-scan type.
 - 3. Integral Timer: Permits programming of recording operation for adjustable daily and weekly periods.
 - 4. Time-Lapse Operating Modes: Multiple, covering 24 to 240 hours, minimum.
 - 5. Other Operating Modes:
 - a. Manual play and recording at two- and six-hour speeds.
 - b. Forward and reverse high-speed search.
 - c. Reverse, slow, and single-frame play.
 - 6. Alarm Recording: Operating mode is automatically switched from time-lapse to two- or six-hour recording mode when an externally generated alarm signal is received.
 - 7. Audio Recording: 70 to 7000 Hz. Phono and microphone input; phono output.
 - 8. Time and Date Generator: Records time and date legend in corner of recorded scenes.
 - 9. Tape Counter: Displays tape position.
 - 10. Manual Recording Lock: Key or keypad operated. Prevents unauthorized tampering or control changes during preset operation.
 - 11. Signal-to-Noise Ratio: 45 dB for video output in standard play mode.
 - 12. Mounting: Standard 19-inch rack complying with CEA 310-E, or freestanding desktop.

2.9 DIGITAL VIDEO RECORDERS

- A. Manufacturers: Subject to compliance with requirements.
- B. Description: Digital, time-lapse type, full-frame and motion recorder, with removable hard drive.
 - 1. Recording Time: 400 hours minimum.
 - 2. Resolution: 720 by 480 lines, minimum.
 - 3. Programming shall be from trackball and push buttons on face of the recorder, settings shall be displayed on any video monitor connected to the recorder. Programming shall include the following:
 - a. Motion analysis graph.
 - b. Password protection.
 - c. Alarm and timer controls.
 - d. Continuous recording option.
 - e. Time-lapse operating modes.
 - f. Search video by time, event, or motion.

4. Programming: Smart-Media card for software updating, image archiving, and image transfer to a PC.
5. Storage: 80-GB, removable hard drive. Software shall permit hot-swapping drives.
6. Compression: MPEG-2.
7. Time and Date Generator: Records time (hr:min:sec) and date legend of each frame.
8. Audio Recording: 70 to 7000 Hz. Phono and microphone input; phono output.
9. Mounting: Standard 19-inch rack complying with CEA 310-E, or freestanding desktop.

2.10 NETWORK VIDEO RECORDERS

- A. Manufacturers: Subject to compliance with requirements.
- B. External storage or internal 250-1, 500-GB hard disk drive.
 1. Video and audio recording over TCP/IP network.
 2. Video recording of MPEG-2 and MPEG-4 streams.
 3. Video recording up to 48 Mbps for internal storage and up to 100 Mbps for external storage.
 4. Duplex Operation: Simultaneous recording and playback.
 5. Continuous and alarm-based recording.
 6. Full-Featured Search Capabilities: Search based on camera, time, or date.
 7. Automatic data replenishment to ensure recording even if network is down.
 8. Digital certification by watermarking.
 9. Internal RAID storage or non-RAID storage of up to 1500 GB.
 10. Capable of adding external RAID storage up to 7000 GB for models with no internal storage.
 11. Full integration with LAN, Intranet, or Internet through standard Web browser or video management software.
 12. Integrated Web server FTP server functionality.
 13. Supports up to 16, 32, or 64 devices.

2.11 DIGITAL SWITCHERS

- A. Manufacturers: Subject to compliance with requirements.
- B. Quad Switch: For displaying images from four cameras on a single monitor. Provide color switcher if one or more cameras or monitors are in color.
 1. Controls: Unit-mounted front panel.
 2. Resolution: 720 by 480 lines.
 3. Modes: Auto, manual, and alarm. In manual mode, each channel can also be viewed in single display mode. In the event of an alarm, alarming channel shall automatically switch to full screen. If several alarms are activated, channels in alarm shall be in auto-switching mode.
 4. Channel Loss Alarm: Audible buzzer; occurrence details shall be recorded.
 5. Time: Indicate date and time.
 6. Timing of Auto-Switcher: 1 to 30 seconds, selectable.
 7. Mounting: Standard 19-inch rack complying with CEA 310-E, or freestanding desktop.

- C. Manual Switch Bank: Low-loss, high-isolation, multiple-video switch to allow manual switching of multiple quad switches and cameras to a single output. Switches shall be illuminated.
- D. Sequential Switchers: Automatically sequence outputs of multiple cameras to single monitor and videotape recorder.
 - 1. Switching Time Interval: Continuously adjustable, 5 to 20 seconds minimum, with manual override.
 - 2. Skip-Sequential-Hold Switch: One for each camera, with LED to indicate active camera.
 - 3. Camera Identification Legend: Either on-screen message or label at skip-sequential switch.
 - 4. Alarm Switching: In the event of an alarm, alarming channel shall automatically switch the monitor to full screen.
 - 5. Mounting: Standard 19-inch rack complying with CEA 310-E.
- E. PTZ Controls: Arranged for multiple-camera control, with switches to select camera to be controlled.
 - 1. Pan-and-Tilt Control: Joystick type.
 - 2. Zoom Control: Momentary-contact, "in-out" push button.
 - 3. Automatic-Scan Control: A push button for each camera with pan capability that places camera in automatic-scanning mode.

2.12 VIDEO MOTION SENSORS (INTERIOR)

- A. Manufacturers: Subject to compliance with requirements.
- B. Device Performance: Detect changes in video signal within a user-defined protected zone. Video inputs shall be composite video as defined in SMPTE 170M. Provide an alarm output for each video input.
 - 1. Detect movement within protected zone of intruders wearing clothing with a reflectivity that differs from that of background scene by a factor of two. Reject all other changes in video signal.
 - 2. Modular design that allows for expansion or modification of number of inputs.
 - 3. Controls:
 - a. Size of detection zones.
 - b. Sensitivity of detection of each protected zone.
 - 4. Mounting: Standard 19-inch rack complying with CEA 310-E.

2.13 CONTROL STATIONS

- A. Manufacturers: Subject to compliance with requirements.

- B. Description: Heavy-duty, freestanding, modular, metal furniture units arranged to house electronic equipment. Coordinate component arrangement and wiring with components and wiring of other systems.
- C. Equipment Mounting: Standard 19-inch rack complying with CEA 310-E.
- D. Normal System Power Supply: 120 V, 60 Hz, through a locked disconnect device and an isolation transformer in central-station control unit. Central-station control unit shall supply power to all components connected to it unless otherwise indicated.
- E. Power Continuity for Control Station: Batteries in power supplies of central-station control units and individual system components shall maintain continuous system operation during outages of both normal and backup ac system supply.
 - 1. Batteries: Rechargeable, valve-regulated, recombinant, sealed, lead-acid type with nominal 10-year life expectancy. Capacity adequate to operate portions of system served including audible trouble signal devices for up to four hours and audible and visual alarm devices under alarm conditions for an additional 10 minutes.
 - 2. Battery Charger: Solid-state, fully automatic, variable-charging-rate type. Charger shall recharge fully discharged battery within 24 hours.
- F. Annunciation: Indicate change in system condition and switching of system or component to backup power.

2.14 SIGNAL TRANSMISSION COMPONENTS

- A. Cable: Coaxial cable elements have 75-ohm nominal impedance. Comply with requirements in Section 280513 "Conductors and Cables for Electronic Safety and Security."
- B. Video Surveillance Coaxial Cable Connectors: BNC type, 75 ohms. Comply with requirements in Section 280513 "Conductors and Cables for Electronic Safety and Security."

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine pathway elements intended for cables. Check raceways and other elements for compliance with space allocations, installation tolerance, hazards to camera installation, and other conditions affecting installation.
- B. Examine roughing-in for LAN, WAN, and IP network before device installation.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 WIRING

- A. Comply with requirements in Section 260533 "Raceways and Boxes for Electrical Systems."
- B. Wiring Method: Install cables in raceways unless otherwise indicated.
 - 1. Except raceways are not required in accessible indoor ceiling spaces and attics.
 - 2. Except raceways are not required in hollow gypsum board partitions.
 - 3. Conceal raceways and wiring except in unfinished spaces.
- C. Wiring within Enclosures: Bundle, lace, and train conductors to terminal points with no excess and without exceeding manufacturer's limitations on bending radii. Provide and use lacing bars and distribution spools.
- D. Splices, Taps, and Terminations: For power and control wiring, use numbered terminal strips in junction, pull, and outlet boxes; terminal cabinets; and equipment enclosures. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A-486B.
- E. For LAN connection and fiber-optic and copper communication wiring, comply with Section 271300 "Communications Backbone Cabling" and Section 271500 "Communications Horizontal Cabling."
- F. Grounding: Provide independent-signal circuit grounding recommended in writing by manufacturer.

3.3 VIDEO SURVEILLANCE SYSTEM INSTALLATION

- A. Install cameras and infrared illuminators level and plumb.
- B. Install cameras with 84-inch- minimum clear space below cameras and their mountings. Change type of mounting to achieve required clearance.
- C. Set pan unit and pan-and-tilt unit stops to suit final camera position and to obtain the field of view required for camera. Connect all controls and alarms, and adjust.
- D. Install power supplies and other auxiliary components at control stations unless otherwise indicated.
- E. Install tamper switches on components indicated to receive tamper switches, arranged to detect unauthorized entry into system-component enclosures and mounted in self-protected, inconspicuous positions.
- F. Avoid ground loops by making ground connections only at the control station.
 - 1. For 12- and 24-V dc cameras, connect the coaxial cable shields only at the monitor end.
- G. Identify system components, wiring, cabling, and terminals according to Section 260553 "Identification for Electrical Systems."

3.4 FIELD QUALITY CONTROL

- A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.
- B. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections.
- C. Perform tests and inspections.
 - 1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.
- D. Tests and Inspections:
 - 1. Inspection: Verify that units and controls are properly installed, connected, and labeled, and that interconnecting wires and terminals are identified.
 - 2. Pretesting: Align and adjust system and pretest components, wiring, and functions to verify that they comply with specified requirements. Conduct tests at varying lighting levels, including day and night scenes as applicable. Prepare video-surveillance equipment for acceptance and operational testing as follows:
 - a. Prepare equipment list described in "Informational Submittals" Article.
 - b. Verify operation of auto-iris lenses.
 - c. Set back-focus of fixed focal length lenses. At focus set to infinity, simulate nighttime lighting conditions by using a dark glass filter of a density that produces a clear image. Adjust until image is in focus with and without the filter.
 - d. Set back-focus of zoom lenses. At focus set to infinity, simulate nighttime lighting conditions by using a dark glass filter of a density that produces a clear image. Additionally, set zoom to full wide angle and aim camera at an object 50 to 75 feet away. Adjust until image is in focus from full wide angle to full telephoto, with the filter in place.
 - e. Set and name all preset positions; consult Owner's personnel.
 - f. Set sensitivity of motion detection.
 - g. Connect and verify responses to alarms.
 - h. Verify operation of control-station equipment.
 - 3. Test Schedule: Schedule tests after pretesting has been successfully completed and system has been in normal functional operation for at least 14 days. Provide a minimum of 10 days' notice of test schedule.
 - 4. Operational Tests: Perform operational system tests to verify that system complies with Specifications. Include all modes of system operation. Test equipment for proper operation in all functional modes.
- E. Video surveillance system will be considered defective if it does not pass tests and inspections.
- F. Prepare test and inspection reports.

3.5 ADJUSTING

- A. Occupancy Adjustments: When requested within 12 months of date of Substantial Completion, provide on-site assistance in adjusting system to suit actual occupied conditions. Provide up to two visits to Project during other-than-normal occupancy hours for this purpose. Tasks shall include, but are not limited to, the following:
 - 1. Check cable connections.
 - 2. Check proper operation of cameras and lenses. Verify operation of auto-iris lenses and adjust back-focus as needed.
 - 3. Adjust all preset positions; consult Owner's personnel.
 - 4. Recommend changes to cameras, lenses, and associated equipment to improve Owner's use of video surveillance system.
 - 5. Provide a written report of adjustments and recommendations.

3.6 CLEANING

- A. Clean installed items using methods and materials recommended in writing by manufacturer.
- B. Clean video-surveillance-system components, including camera-housing windows, lenses, and monitor screens.

3.7 DEMONSTRATION

- A. Engage a factory-authorized service representative to train owner's maintenance personnel to adjust, operate, and maintain video-surveillance equipment.

END OF SECTION 282300

SECTION 282313 - VIDEO SURVEILLANCE, STORAGE, RECORDING
AND MANAGEMENT SYSTEM

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes a video surveillance system consisting of cameras, digital video recorder, data transmission wiring, and a control station with its associated equipment.
- B. Video surveillance system shall be integrated with monitoring and control system specified in Section 281600 "Intrusion Detection," and Section 281353 "Metal Detector and X-Ray Inspection," which specifies systems integration.

1.3 DEFINITIONS

- A. AGC: Automatic gain control.
- B. BNC: Bayonet Neill-Concelman - type of connector.
- C. B/W: Black and white.
- D. CCD: Charge-coupled device.
- E. FTP: File transfer protocol.
- F. IP: Internet protocol.
- G. LAN: Local area network.
- H. MPEG: Moving picture experts group.
- I. NTSC: National Television System Committee.
- J. PC: Personal computer.
- K. PTZ: Pan-tilt-zoom.
- L. RAID: Redundant array of independent disks.

- M. TCP: Transmission control protocol - connects hosts on the Internet.
- N. UPS: Uninterruptible power supply.
- O. WAN: Wide area network.

1.4 PERFORMANCE REQUIREMENTS

- A. Seismic Performance: Video surveillance system shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.
 - 1. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified and the unit will be fully operational after the seismic event."

1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated. Include dimensions and data on features, performance, electrical characteristics, ratings, and finishes.
- B. Shop Drawings: For video surveillance. Include plans, elevations, sections, details, and attachments to other work.
 - 1. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
 - 2. Functional Block Diagram: Show single-line interconnections between components for signal transmission and control. Show cable types and sizes.
 - 3. Dimensioned plan and elevations of equipment racks, control panels, and consoles. Show access and workspace requirements.
 - 4. UPS: Sizing calculations.
 - 5. Wiring Diagrams: For power, signal, and control wiring.
- C. Equipment List: Include every piece of equipment by model number, manufacturer, serial number, location, and date of original installation. Add pretesting record of each piece of equipment, listing name of person testing, date of test, set points of adjustments, name and description of the view of preset positions, description of alarms, and description of unit output responses to an alarm.

1.6 INFORMATIONAL SUBMITTALS

- A. Seismic Qualification Certificates: For video surveillance, cameras, camera-supporting equipment, accessories, and components, from manufacturer.
 - 1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.

2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

B. Field quality-control reports.

C. Warranty: Sample of special warranty.

1.7 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For cameras, power supplies, infrared illuminators, monitors, videotape recorders, digital video recorders, video switches, and control-station components to include in emergency, operation, and maintenance manuals. In addition to items specified in Section 017823 "Operation and Maintenance Data," include the following:

1. Lists of spare parts and replacement components recommended to be stored at the site for ready access.

1.8 QUALITY ASSURANCE

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

B. Comply with NECA 1.

C. Comply with NFPA 70.

D. Electronic data exchange between video surveillance system with an access-control system shall comply with SIA TVAC.

1.9 PROJECT CONDITIONS

A. Environmental Conditions: Capable of withstanding the following environmental conditions without mechanical or electrical damage or degradation of operating capability:

1. Control Station: Rated for continuous operation in ambient temperatures of 60 to 85 deg F and a relative humidity of 20 to 80 percent, noncondensing.
2. Interior, Controlled Environment: System components, except central-station control unit, installed in air-conditioned or temperature-controlled interior environments shall be rated for continuous operation in ambient temperatures of 36 to 122 deg F dry bulb and 20 to 90 percent relative humidity, noncondensing. Use NEMA 250, Type 1 enclosures.
3. Interior, Uncontrolled Environment: System components installed in non-air-conditioned or temperature-controlled interior environments shall be rated for continuous operation in ambient temperatures of 0 to 122 deg F dry bulb and 20 to 90 percent relative humidity, noncondensing. Use NEMA 250, Type 3R, Type 4, Type 12 or Type 12K enclosures.

4. Exterior Environment: System components installed in locations exposed to weather shall be rated for continuous operation in ambient temperatures of minus 30 to plus 122 deg F dry bulb and 20 to 90 percent relative humidity, condensing. Rate for continuous operation when exposed to rain as specified in NEMA 250, winds up to 85 mph and snow cover up to 24 inches thick. Use NEMA 250, Type 3, Type 3R, Type 3S, Type 4 or Type 4X enclosures.
5. Hazardous Environment: System components located in areas where fire or explosion hazards may exist because of flammable gases or vapors, flammable liquids, combustible dust, or ignitable fibers shall be rated, listed, and installed according to NFPA 70.
6. Corrosive Environment: System components subject to corrosive fumes, vapors, and wind-driven salt spray in coastal zones. Use NEMA 250, Type 4X or Type 6P enclosures.
7. Security Environment: Camera housing for use in high-risk areas where surveillance equipment may be subject to physical violence.

1.10 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of cameras, equipment related to camera operation, and control-station equipment that fail in materials or workmanship within specified warranty period.
 1. Warranty Period: Three years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 SYSTEM REQUIREMENTS

- A. Video-signal format shall comply with NTSC standard, composite interlaced video. Composite video-signal termination shall be 75 ohms.
- B. Surge Protection: Protect components from voltage surges originating external to equipment housing and entering through power, communication, signal, control, or sensing leads. Include surge protection for external wiring of each conductor's entry connection to components.
 1. Minimum Protection for Power Connections 120 V and More: Auxiliary panel suppressors complying with requirements in Section 264313 "Surge Protection for Low-Voltage Electrical Power Circuits."
 2. Minimum Protection for Communication, Signal, Control, and Low-Voltage Power Connections: Comply with requirements in Section 264313 "Surge Protection for Low-Voltage Electrical Power Circuits" as recommended by manufacturer for type of line being protected.
- C. Tamper Protection: Tamper switches on enclosures, control units, pull boxes, junction boxes, cabinets, and other system components shall initiate a tamper-alarm signal when unit is opened or partially disassembled. Control-station, control-unit alarm display shall identify tamper alarms and indicate locations.

2.2 STANDARD CAMERAS

- A. Manufacturers: Subject to compliance with requirements.
- B. B/W Camera:
 - 1. Comply with UL 639.
 - 2. Pickup Device: CCD interline transfer, 252,000 512(H) by 492(V) pixels.
 - 3. Horizontal Resolution: 380 lines.
 - 4. Signal-to-Noise Ratio: Not less than 46 dB.
 - 5. With AGC, manually selectable on or off.
 - 6. Sensitivity: Camera shall provide usable images in low-light conditions, delivering an image at a scene illumination of lux, as specified, at f/1.4, with camera AGC off.
 - 7. Sensitivity: Camera shall deliver 1-V peak-to-peak video signal at the minimum specified light level. Illumination for the test shall be with lamps rated at approximately 2200-K color temperature, and with camera AGC off.
 - 8. Manually selectable modes for backlight compensation or normal lighting.
 - 9. Scanning Synchronization: Determined by external synch over the coaxial cable. Camera shall revert to internally generated synchronization on loss of external synch signal.
 - 10. Motion Detector: Built-in digital.
- C. Color Camera:
 - 1. Comply with UL 639.
 - 2. Pickup Device: CCD interline transfer, 380,000 771(H) by 492(V) pixels.
 - 3. Horizontal Resolution: 480 lines.
 - 4. Signal-to-Noise Ratio: Not less than 50 dB, with camera AGC off.
 - 5. With AGC, manually selectable on or off.
 - 6. Sensitivity: Camera shall provide usable images in low-light conditions, delivering an image at a scene illumination of lux, as required, and stop when specified, with camera AGC off.
 - 7. Sensitivity: Camera shall deliver 1-V peak-to-peak video signal at the minimum specified light level. Illumination for the test shall be with lamps rated at approximately 2200-K color temperature, and with camera AGC off.
 - 8. Manually selectable modes for backlight compensation or normal lighting.
 - 9. Scanning Synchronization: Determined by external synch over the coaxial cable. Camera shall revert to internally generated synchronization on loss of external synch signal.
 - 10. White Balance: Auto-tracing white balance, with manually settable fixed balance option.
 - 11. Motion Detector: Built-in digital.
- D. Automatic Color Dome Camera: Assembled and tested as a manufactured unit, containing dome assembly, color camera, motorized pan and tilt, zoom lens, and receiver/driver.
 - 1. Comply with UL 639.
 - 2. Pickup Device: CCD interline transfer, 380,000 768(H) by 494(V) pixels.
 - 3. Horizontal Resolution: 480 lines.
 - 4. Signal-to-Noise Ratio: Not less than 50 dB, with camera AGC off.
 - 5. With AGC, manually selectable on or off.

6. Sensitivity: Camera shall provide usable images in low-light conditions, delivering an image at a scene illumination of lux at (as required) Insert f-stop of lens (f stop specified), with camera AGC off.
7. Sensitivity: Camera shall deliver 1-V peak-to-peak video signal at the minimum specified light level. Illumination for the test shall be with lamps rated at approximately 2200-K color temperature, and with camera AGC off.
8. Manually selectable modes for backlight compensation or normal lighting.
9. Pan and Tilt: Direct-drive motor, 360-degree rotation angle, and 180-degree tilt angle. Pan-and-tilt speed shall be controlled by operator. Movement from preset positions shall be not less than 300 degrees per second.
10. Preset Positioning: Eight user-definable scenes, each allowing 16-character titles. Controls shall include the following:
 - a. In "sequence mode," camera shall continuously sequence through preset positions, with dwell time and sequencing under operator control.
 - b. Motion detection shall be available at each camera position.
 - c. Up to four preset positions may be selected to be activated by an alarm. Each of the alarm positions may be programmed to output a response signal.
11. Scanning Synchronization: Determined by external synch over the coaxial cable. Camera shall revert to internally generated synchronization on loss of external synch signal.
12. White Balance: Auto-tracing white balance, with manually settable fixed balance option.
13. Motion Detector: Built-in digital.
14. Dome shall support multiplexed control communications using coaxial cable recommended by manufacturer.

2.3 REINFORCED DOME CAMERAS

- A. Manufacturers: Subject to compliance with requirements.
- B. Camera: Designed for high-abuse locations, with a weathertight semi-recessed or surface mounting, impact-resistance polycarbonate dome, and heavy-gage, 6061 T6 aluminum body.
 1. Suitable for exterior environment, rated for continuous operation in ambient temperatures of minus 40 to plus 122 deg F dry bulb and up to 85 percent relative humidity.
 2. Pickup Device: CCD interline transfer, 290,000 510(H) by 492(V) pixels.
 3. Horizontal Resolution: 350 lines.
 4. Signal-to-Noise Ratio: Not less than 46 dB.
 5. With AGC and automatic backlight compensation.
 6. Sensitivity: Camera shall provide usable images in low-light conditions, delivering an image at a scene illumination of 6 lux at f/2.0.
 7. Scanning Synchronization: Determined by external synch over the coaxial cable. Camera shall revert to internally generated synchronization on loss of external synch signal.
 8. White Balance: Auto-tracing white balance.

2.4 LENSES

- A. Manufacturers: Subject to compliance with requirements.
- B. Description: Optical-quality coated lens, designed specifically for video-surveillance applications and matched to specified camera. Provide color-corrected lenses with color cameras.
 - 1. Auto-Iris Lens: Electrically controlled iris with circuit set to maintain a constant video level in varying lighting conditions.
 - 2. Fixed Lens: With calibrated focus ring.
 - 3. Zoom Lens: Motorized, remote-controlled unit, rated as "quiet operating." Features include the following:
 - a. Electrical Leads: Filtered to minimize video signal interference.
 - b. Motor Speed: Variable.
 - c. Lens shall be available with preset positioning capability to recall the position of specific scenes.

2.5 POWER SUPPLIES

- A. Low-voltage power supplies matched for voltage and current requirements of cameras and accessories, and of type as recommended by manufacturer of camera, infrared illuminator, and lens.
 - 1. Enclosure: NEMA 250, Type 1, Type 3 or Type 4X.

2.6 CAMERA-SUPPORTING EQUIPMENT

- A. Manufacturers: Subject to compliance with requirements.
- B. Minimum Load Rating: Rated for load in excess of the total weight supported times a minimum safety factor of two.
- C. Pan Units: Motorized automatic-scanning units arranged to provide remote-controlled manual and automatic camera panning action, and equipped with matching mounting brackets.
 - 1. Scanning Operation: Silent, smooth, and positive.
 - 2. Stops: Adjustable without disassembly, to limit the scanning arc.
- D. Pan-and-Tilt Units: Motorized units arranged to provide remote-controlled aiming of cameras with smooth and silent operation, and equipped with matching mounting brackets.
 - 1. Panning Rotation: 0 to 355 degrees, with adjustable stops.
 - 2. Tilt Movement: 90 degrees, plus or minus 5 degrees, with adjustable stops.
 - 3. Speed: 12 degrees per second in both horizontal and vertical planes.
 - 4. Wiring: Factory prewired for camera and zoom lens functions and pan-and-tilt power and control.

5. Built-in encoders or potentiometers for position feedback, and thermostat-controlled heater.
 6. Pan-and-tilt unit shall be available with preset positioning capability to recall the position of a specific scene.
- E. Mounting Brackets for Fixed Cameras: Type matched to items supported and mounting conditions. Include manual pan-and-tilt adjustment.
- F. Protective Housings for Fixed and Movable Cameras: Steel or 6061 T6 aluminum enclosures with internal camera mounting and connecting provisions that are matched to camera/lens combination and mounting and installing arrangement of camera to be housed.
1. Tamper switch on access cover sounds an alarm signal when unit is opened or partially disassembled. Central-control unit shall identify tamper alarms and indicate location in alarm display. Tamper switches and central-control unit are specified in Section 281600 "Intrusion Detection."
 2. Camera Viewing Window: Polycarbonate or Lexan window, aligned with camera lens.
 3. Duplex Receptacle: Internally mounted.
 4. Alignment Provisions: Camera mounting shall provide for field aiming of camera and permit removal and reinstallation of camera lens without disturbing camera alignment.
 5. Built-in, thermostat-activated heater and blower units. Units shall be automatically controlled so the environmental limits of the camera equipment are not exceeded.
 6. Sun shield shall not interfere with normal airflow around the housing.
 7. Mounting bracket and hardware for wall or ceiling mounting of the housing. Bracket shall be of same material as the housing; mounting hardware shall be stainless steel.
 8. Finish: Housing and mounting bracket shall be factory finished using manufacturer's standard finishing process suitable for the environment.
 9. Enclosure Rating: (Insert NEMA Type designation) (Insert Ingress Protection code designation).

2.7 MONITORS

- A. Manufacturers: Subject to compliance with requirements.
- B. Color:
1. Metal cabinet units designed for continuous operation.
 2. Screen Size (Diagonal Dimension): As specified
 3. Horizontal Resolution: 300 lines.
 4. Minimum Front Panel Devices and Controls: Power switch; power-on indicator; and brightness, contrast, color, and tint controls.
 5. Degaussing: Automatic.
 6. Mounting: Single, 14-inch or Dual, 9-inch, vertical, EIA 19-inch electronic equipment rack or cabinet complying with CEA 310-E.
 7. Electrical: 120-V ac, 60 Hz.

2.8 VIDEOTAPE RECORDERS

- A. Manufacturers: Subject to compliance with requirements.
- B. Description: Industrial, time-lapse type recorder, designed for continuous operation. Tape format is 1/2 inch using industrial-grade, T-120 cassettes.
 - 1. Horizontal Resolution: 400 lines, minimum.
 - 2. Recording Heads: Rotary-scan type.
 - 3. Integral Timer: Permits programming of recording operation for adjustable daily and weekly periods.
 - 4. Time-Lapse Operating Modes: Multiple, covering 24 to 240 hours, minimum.
 - 5. Other Operating Modes:
 - a. Manual play and recording at two- and six-hour speeds.
 - b. Forward and reverse high-speed search.
 - c. Reverse, slow, and single-frame play.
 - 6. Alarm Recording: Operating mode is automatically switched from time-lapse to two- or six-hour recording mode when an externally generated alarm signal is received.
 - 7. Audio Recording: 70 to 7000 Hz. Phono and microphone input; phono output.
 - 8. Time and Date Generator: Records time and date legend in corner of recorded scenes.
 - 9. Tape Counter: Displays tape position.
 - 10. Manual Recording Lock: Key or keypad operated. Prevents unauthorized tampering or control changes during preset operation.
 - 11. Signal-to-Noise Ratio: 45 dB for video output in standard play mode.
 - 12. Mounting: Standard 19-inch rack complying with CEA 310-E, or freestanding desktop.

2.9 DIGITAL VIDEO RECORDERS

- A. Manufacturers: Subject to compliance with requirements.
- B. Description: Digital, time-lapse type, full-frame and motion recorder, with removable hard drive.
 - 1. Recording Time: 400 hours minimum.
 - 2. Resolution: 720 by 480 lines, minimum.
 - 3. Programming shall be from trackball and push buttons on face of the recorder, settings shall be displayed on any video monitor connected to the recorder. Programming shall include the following:
 - a. Motion analysis graph.
 - b. Password protection.
 - c. Alarm and timer controls.
 - d. Continuous recording option.
 - e. Time-lapse operating modes.
 - f. Search video by time, event, or motion.

4. Programming: Smart-Media card for software updating, image archiving, and image transfer to a PC.
5. Storage: 80-GB, removable hard drive. Software shall permit hot-swapping drives.
6. Compression: MPEG-2.
7. Time and Date Generator: Records time (hr:min:sec) and date legend of each frame.
8. Audio Recording: 70 to 7000 Hz. Phono and microphone input; phono output.
9. Mounting: Standard 19-inch rack complying with CEA 310-E, or freestanding desktop.

2.10 NETWORK VIDEO RECORDERS

- A. Manufacturers: Subject to compliance with requirements.
- B. External storage or internal 250-1, 500-GB hard disk drive.
 1. Video and audio recording over TCP/IP network.
 2. Video recording of MPEG-2 and MPEG-4 streams.
 3. Video recording up to 48 Mbps for internal storage and up to 100 Mbps for external storage.
 4. Duplex Operation: Simultaneous recording and playback.
 5. Continuous and alarm-based recording.
 6. Full-Featured Search Capabilities: Search based on camera, time, or date.
 7. Automatic data replenishment to ensure recording even if network is down.
 8. Digital certification by watermarking.
 9. Internal RAID storage or non-RAID storage of up to 1500 GB.
 10. Capable of adding external RAID storage up to 7000 GB for models with no internal storage.
 11. Full integration with LAN, Intranet, or Internet through standard Web browser or video management software.
 12. Integrated Web server FTP server functionality.
 13. Supports up to 16, 32, or 64 devices.

2.11 DIGITAL SWITCHERS

- A. Manufacturers: Subject to compliance with requirements.
- B. Quad Switch: For displaying images from four cameras on a single monitor. Provide color switcher if one or more cameras or monitors are in color.
 1. Controls: Unit-mounted front panel.
 2. Resolution: 720 by 480 lines.
 3. Modes: Auto, manual, and alarm. In manual mode, each channel can also be viewed in single display mode. In the event of an alarm, alarming channel shall automatically switch to full screen. If several alarms are activated, channels in alarm shall be in auto-switching mode.
 4. Channel Loss Alarm: Audible buzzer; occurrence details shall be recorded.
 5. Time: Indicate date and time.
 6. Timing of Auto-Switcher: 1 to 30 seconds, selectable.
 7. Mounting: Standard 19-inch rack complying with CEA 310-E, or freestanding desktop.

- C. Manual Switch Bank: Low-loss, high-isolation, multiple-video switch to allow manual switching of multiple quad switches and cameras to a single output. Switches shall be illuminated.
- D. Sequential Switchers: Automatically sequence outputs of multiple cameras to single monitor and videotape recorder.
 - 1. Switching Time Interval: Continuously adjustable, 5 to 20 seconds minimum, with manual override.
 - 2. Skip-Sequential-Hold Switch: One for each camera, with LED to indicate active camera.
 - 3. Camera Identification Legend: Either on-screen message or label at skip-sequential switch.
 - 4. Alarm Switching: In the event of an alarm, alarming channel shall automatically switch the monitor to full screen.
 - 5. Mounting: Standard 19-inch rack complying with CEA 310-E.
- E. PTZ Controls: Arranged for multiple-camera control, with switches to select camera to be controlled.
 - 1. Pan-and-Tilt Control: Joystick type.
 - 2. Zoom Control: Momentary-contact, "in-out" push button.
 - 3. Automatic-Scan Control: A push button for each camera with pan capability that places camera in automatic-scanning mode.

2.12 VIDEO MOTION SENSORS (INTERIOR)

- A. Manufacturers: Subject to compliance with requirements.
- B. Device Performance: Detect changes in video signal within a user-defined protected zone. Video inputs shall be composite video as defined in SMPTE 170M. Provide an alarm output for each video input.
 - 1. Detect movement within protected zone of intruders wearing clothing with a reflectivity that differs from that of background scene by a factor of two. Reject all other changes in video signal.
 - 2. Modular design that allows for expansion or modification of number of inputs.
 - 3. Controls:
 - a. Size of detection zones.
 - b. Sensitivity of detection of each protected zone.
 - 4. Mounting: Standard 19-inch rack complying with CEA 310-E.

2.13 CONTROL STATIONS

- A. Manufacturers: Subject to compliance with requirements.

- B. Description: Heavy-duty, freestanding, modular, metal furniture units arranged to house electronic equipment. Coordinate component arrangement and wiring with components and wiring of other systems.
- C. Equipment Mounting: Standard 19-inch rack complying with CEA 310-E.
- D. Normal System Power Supply: 120 V, 60 Hz, through a locked disconnect device and an isolation transformer in central-station control unit. Central-station control unit shall supply power to all components connected to it unless otherwise indicated.
- E. Power Continuity for Control Station: Batteries in power supplies of central-station control units and individual system components shall maintain continuous system operation during outages of both normal and backup ac system supply.
 - 1. Batteries: Rechargeable, valve-regulated, recombinant, sealed, lead-acid type with nominal 10-year life expectancy. Capacity adequate to operate portions of system served including audible trouble signal devices for up to four hours and audible and visual alarm devices under alarm conditions for an additional 10 minutes.
 - 2. Battery Charger: Solid-state, fully automatic, variable-charging-rate type. Charger shall recharge fully discharged battery within 24 hours.
- F. Annunciation: Indicate change in system condition and switching of system or component to backup power.

2.14 SIGNAL TRANSMISSION COMPONENTS

- A. Cable: Coaxial cable elements have 75-ohm nominal impedance. Comply with requirements in Section 280513 "Conductors and Cables for Electronic Safety and Security."
- B. Video Surveillance Coaxial Cable Connectors: BNC type, 75 ohms. Comply with requirements in Section 280513 "Conductors and Cables for Electronic Safety and Security."

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine pathway elements intended for cables. Check raceways and other elements for compliance with space allocations, installation tolerance, hazards to camera installation, and other conditions affecting installation.
- B. Examine roughing-in for LAN, WAN, and IP network before device installation.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 WIRING

- A. Comply with requirements in Section 260533 "Raceways and Boxes for Electrical Systems."
- B. Wiring Method: Install cables in raceways unless otherwise indicated.
 - 1. Except raceways are not required in accessible indoor ceiling spaces and attics.
 - 2. Except raceways are not required in hollow gypsum board partitions.
 - 3. Conceal raceways and wiring except in unfinished spaces.
- C. Wiring within Enclosures: Bundle, lace, and train conductors to terminal points with no excess and without exceeding manufacturer's limitations on bending radii. Provide and use lacing bars and distribution spools.
- D. Splices, Taps, and Terminations: For power and control wiring, use numbered terminal strips in junction, pull, and outlet boxes; terminal cabinets; and equipment enclosures. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A-486B.
- E. For LAN connection and fiber-optic and copper communication wiring, comply with Section 271300 "Communications Backbone Cabling" and Section 271500 "Communications Horizontal Cabling."
- F. Grounding: Provide independent-signal circuit grounding recommended in writing by manufacturer.

3.3 VIDEO SURVEILLANCE SYSTEM INSTALLATION

- A. Install cameras and infrared illuminators level and plumb.
- B. Install cameras with 84-inch- minimum clear space below cameras and their mountings. Change type of mounting to achieve required clearance.
- C. Set pan unit and pan-and-tilt unit stops to suit final camera position and to obtain the field of view required for camera. Connect all controls and alarms, and adjust.
- D. Install power supplies and other auxiliary components at control stations unless otherwise indicated.
- E. Install tamper switches on components indicated to receive tamper switches, arranged to detect unauthorized entry into system-component enclosures and mounted in self-protected, inconspicuous positions.
- F. Avoid ground loops by making ground connections only at the control station.
 - 1. For 12- and 24-V dc cameras, connect the coaxial cable shields only at the monitor end.
- G. Identify system components, wiring, cabling, and terminals according to Section 260553 "Identification for Electrical Systems."

3.4 FIELD QUALITY CONTROL

- A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.
- B. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections.
- C. Perform tests and inspections.
 - 1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.
- D. Tests and Inspections:
 - 1. Inspection: Verify that units and controls are properly installed, connected, and labeled, and that interconnecting wires and terminals are identified.
 - 2. Pretesting: Align and adjust system and pretest components, wiring, and functions to verify that they comply with specified requirements. Conduct tests at varying lighting levels, including day and night scenes as applicable. Prepare video-surveillance equipment for acceptance and operational testing as follows:
 - a. Prepare equipment list described in "Informational Submittals" Article.
 - b. Verify operation of auto-iris lenses.
 - c. Set back-focus of fixed focal length lenses. At focus set to infinity, simulate nighttime lighting conditions by using a dark glass filter of a density that produces a clear image. Adjust until image is in focus with and without the filter.
 - d. Set back-focus of zoom lenses. At focus set to infinity, simulate nighttime lighting conditions by using a dark glass filter of a density that produces a clear image. Additionally, set zoom to full wide angle and aim camera at an object 50 to 75 feet away. Adjust until image is in focus from full wide angle to full telephoto, with the filter in place.
 - e. Set and name all preset positions; consult Owner's personnel.
 - f. Set sensitivity of motion detection.
 - g. Connect and verify responses to alarms.
 - h. Verify operation of control-station equipment.
 - 3. Test Schedule: Schedule tests after pretesting has been successfully completed and system has been in normal functional operation for at least 14 days. Provide a minimum of 10 days' notice of test schedule.
 - 4. Operational Tests: Perform operational system tests to verify that system complies with Specifications. Include all modes of system operation. Test equipment for proper operation in all functional modes.
- E. Video surveillance system will be considered defective if it does not pass tests and inspections.
- F. Prepare test and inspection reports.

3.5 ADJUSTING

- A. Occupancy Adjustments: When requested within 12 months of date of Substantial Completion, provide on-site assistance in adjusting system to suit actual occupied conditions. Provide up to two visits to Project during other-than-normal occupancy hours for this purpose. Tasks shall include, but are not limited to, the following:
 - 1. Check cable connections.
 - 2. Check proper operation of cameras and lenses. Verify operation of auto-iris lenses and adjust back-focus as needed.
 - 3. Adjust all preset positions; consult Owner's personnel.
 - 4. Recommend changes to cameras, lenses, and associated equipment to improve Owner's use of video surveillance system.
 - 5. Provide a written report of adjustments and recommendations.

3.6 CLEANING

- A. Clean installed items using methods and materials recommended in writing by manufacturer.
- B. Clean video-surveillance-system components, including camera-housing windows, lenses, and monitor screens.

3.7 DEMONSTRATION

- A. Engage a factory-authorized service representative to train owner's maintenance personnel to adjust, operate, and maintain video-surveillance equipment.

END OF SECTION 282313

SECTION 283111 - DIGITAL, ADDRESSABLE FIRE-ALARM SYSTEM

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:

1. Fire-alarm control unit.
2. Manual fire-alarm boxes.
3. System smoke detectors.
4. Non-system smoke detectors.
5. Heat detectors.
6. Notification appliances.
7. Firefighters' two-way telephone communication service.
8. Magnetic door holders.
9. Remote annunciator.
10. Addressable interface device.
11. Digital alarm communicator transmitter.
12. Radio alarm transmitter.
13. System printer.

1.3 DEFINITIONS

- A. LED: Light-emitting diode.
- B. NICET: National Institute for Certification in Engineering Technologies.

1.4 SYSTEM DESCRIPTION

- A. Non-coded, UL-certified or FMG-placarded addressable system, with multiplexed signal transmission, dedicated to fire-alarm service only.
- B. Non-coded addressable system, with automatic sensitivity control of certain smoke detectors and multiplexed signal transmission, dedicated to fire-alarm service only.

1.5 PERFORMANCE REQUIREMENTS

- A. Seismic Performance: Fire-alarm control unit and raceways shall withstand the effects of earthquake motions determined according to SEI/ASCE 7.
 - 1. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified and the unit will be fully operational after the seismic event."

1.6 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: For fire-alarm system. Include plans, elevations, sections, details, and attachments to other work.
 - 1. Comply with recommendations in the "Documentation" Section of the "Fundamentals of Fire Alarm Systems" Chapter in NFPA 72.
 - 2. Include voltage drop calculations for notification appliance circuits.
 - 3. Include battery-size calculations.
 - 4. Include performance parameters and installation details for each detector, verifying that each detector is listed for complete range of air velocity, temperature, and humidity possible when air-handling system is operating.
 - 5. Include plans, sections, and elevations of heating, ventilating, and air-conditioning ducts, drawn to scale and coordinating installation of duct smoke detectors and access to them. Show critical dimensions that relate to placement and support of sampling tubes, detector housing, and remote status and alarm indicators. Locate detectors according to manufacturer's written recommendations.
 - 6. Include voice/alarm signaling-service equipment rack or console layout, grounding schematic, amplifier power calculation, and single-line connection diagram.
 - 7. Include floor plans to indicate final outlet locations showing address of each addressable device. Show size and route of cable and conduits.
- C. General Submittal Requirements:
 - 1. Submittals shall be approved by authorities having jurisdiction prior to submitting them to Architect.
 - 2. Shop Drawings shall be prepared by persons with the following qualifications:
 - a. Trained and certified by manufacturer in fire-alarm system design.
 - b. NICET-certified fire-alarm technician, Level III or Level IV minimum.
 - c. Licensed or certified by authorities having jurisdiction.
- D. Delegated-Design Submittal: For smoke and heat detectors indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1. Drawings showing the location of each smoke and heat detector, ratings of each, and installation details as needed to comply with listing conditions of the detector.
2. Design Calculations: Calculate requirements for selecting the spacing and sensitivity of detection, complying with NFPA 72.

1.7 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For qualified Installer.
- B. Seismic Qualification Certificates: For fire-alarm control unit, accessories, and components, from manufacturer.
 1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
 2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
 3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.
- C. Field quality-control reports.

1.8 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For fire-alarm systems and components to include in emergency, operation, and maintenance manuals. In addition to items specified in Section 017823 "Operation and Maintenance Data," deliver copies to authorities having jurisdiction and include the following:
 1. Comply with the "Records" Section of the "Inspection, Testing and Maintenance" Chapter in NFPA 72.
 2. Provide "Record of Completion Documents" according to NFPA 72 article "Permanent Records" in the "Records" Section of the "Inspection, Testing and Maintenance" Chapter.
 3. Record copy of site-specific software.
 4. Provide "Maintenance, Inspection and Testing Records" according to NFPA 72 article of the same name and include the following:
 - a. Frequency of testing of installed components.
 - b. Frequency of inspection of installed components.
 - c. Requirements and recommendations related to results of maintenance.
 - d. Manufacturer's user training manuals.
 5. Manufacturer's required maintenance related to system warranty requirements.
 6. Abbreviated operating instructions for mounting at fire-alarm control unit.

B. Software and Firmware Operational Documentation:

1. Software operating and upgrade manuals.
2. Program Software Backup: On magnetic media or compact disk, complete with data files.
3. Device address list.
4. Printout of software application and graphic screens.

1.9 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Lamps for Remote Indicating Lamp Units: Quantity equal to 10 percent of amount installed, but no fewer than 1 unit.
2. Lamps for Strobe Units: Quantity equal to 10 percent of amount installed, but no fewer than 1 unit.
3. Smoke Detectors, Fire Detectors, and Flame Detectors: Quantity equal to 10 percent of amount of each type installed, but no fewer than 1 unit of each type.
4. Detector Bases: Quantity equal to 2 percent of amount of each type installed, but no fewer than 1 unit of each type.
5. Keys and Tools: One extra set for access to locked and tamper proofed components.
6. Audible and Visual Notification Appliances: One of each type installed.
7. Fuses: Two of each type installed in the system.

1.10 QUALITY ASSURANCE

- A. Installer Qualifications: Personnel shall be trained and certified by manufacturer for installation of units required for this Project.
- B. Installer Qualifications: Installation shall be by personnel certified by NICET as fire-alarm Level II, Level III or Level IV technician.
- C. Source Limitations for Fire-Alarm System and Components: Obtain fire-alarm system from single source from single manufacturer. Components shall be compatible with, and operate as, an extension of existing system.
- D. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- E. NFPA Certification: Obtain certification according to NFPA 72 by an NRTL.
- F. NFPA Certification: Obtain certification according to NFPA 72 by a UL-listed alarm company.
- G. NFPA Certification: Obtain certification according to NFPA 72 in the form of a placard by an FMG-approved alarm company.
- H. NFPA Certification: Obtain certification according to NFPA 72 by.

1.11 PROJECT CONDITIONS

- A. Interruption of Existing Fire-Alarm Service: Do not interrupt fire-alarm service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary guard service according to requirements indicated:
 - 1. Notify Architect, Construction Manager or Owner no fewer than two days in advance of proposed interruption of fire-alarm service.
 - 2. Do not proceed with interruption of fire-alarm service without Architect's, Construction Manager's or Owner's written permission.

1.12 SEQUENCING AND SCHEDULING

- A. Existing Fire-Alarm Equipment: Maintain existing equipment fully operational until new equipment has been tested and accepted. As new equipment is installed, label it "NOT IN SERVICE" until it is accepted. Remove labels from new equipment when put into service and label existing fire-alarm equipment "NOT IN SERVICE" until removed from the building.
- B. Equipment Removal: After acceptance of new fire-alarm system, remove existing disconnected fire-alarm equipment and wiring.

1.13 SOFTWARE SERVICE AGREEMENT

- A. Comply with UL 864.
- B. Technical Support: Beginning with Substantial Completion, provide software support for two years.
- C. Upgrade Service: Update software to latest version at Project completion. Install and program software upgrades that become available within two years from date of Substantial Completion. Upgrading software shall include operating system. Upgrade shall include new or revised licenses for use of software.
 - 1. Provide 30 days' notice to Owner to allow scheduling and access to system and to allow Owner to upgrade computer equipment if necessary.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements.

2.2 SYSTEMS OPERATIONAL DESCRIPTION

- A. Fire-alarm signal initiation shall be by one or more of the following devices and systems:
1. Manual stations.
 2. Heat detectors.
 3. Flame detectors.
 4. Smoke detectors.
 5. Duct smoke detectors.
 6. Verified automatic alarm operation of smoke detectors.
 7. Automatic sprinkler system water flow.
 8. Heat detectors in elevator shaft and pit.
 9. Fire-extinguishing system operation.
 10. Fire standpipe system.
- B. Fire-alarm signal shall initiate the following actions:
1. Continuously operate alarm notification appliances.
 2. Identify alarm at fire-alarm control unit and remote annunciators.
 3. Transmit an alarm signal to the remote alarm receiving station.
 4. Unlock electric door locks in designated egress paths.
 5. Release fire and smoke doors held open by magnetic door holders.
 6. Activate voice/alarm communication system.
 7. Switch heating, ventilating, and air-conditioning equipment controls to fire-alarm mode.
 8. Activate smoke-control system (smoke management) at firefighter smoke-control system panel.
 9. Activate stairwell and elevator-shaft pressurization systems.
 10. Close smoke dampers in air ducts of designated air-conditioning duct systems.
 11. Recall elevators to primary or alternate recall floors.
 12. Activate emergency lighting control.
 13. Activate emergency shutoffs for gas and fuel supplies.
 14. Record events in the system memory.
 15. Record events by the system printer.
- C. Supervisory signal initiation shall be by one or more of the following devices and actions:
1. Valve supervisory switch.
 2. Low-air-pressure switch of a dry-pipe sprinkler system.
 3. Elevator shunt-trip supervision.
- D. System trouble signal initiation shall be by one or more of the following devices and actions:
1. Open circuits, shorts, and grounds in designated circuits.
 2. Opening, tampering with, or removing alarm-initiating and supervisory signal-initiating devices.
 3. Loss of primary power at fire-alarm control unit.
 4. Ground or a single break in fire-alarm control unit internal circuits.
 5. Abnormal ac voltage at fire-alarm control unit.

6. Break in standby battery circuitry.
 7. Failure of battery charging.
 8. Abnormal position of any switch at fire-alarm control unit or annunciator.
 9. Fire-pump power failure, including a dead-phase or phase-reversal condition.
 10. Low-air-pressure switch operation on a dry-pipe or preaction sprinkler system.
- E. System Trouble and Supervisory Signal Actions: Initiate notification appliance and annunciate at fire-alarm control unit and remote annunciators. Record the event on system printer.

2.3 FIRE-ALARM CONTROL UNIT

A. General Requirements for Fire-Alarm Control Unit:

1. Field-programmable, microprocessor-based, modular, power-limited design with electronic modules, complying with UL 864 and listed and labeled by an NRTL.
 - a. System software and programs shall be held in flash electrically erasable programmable read-only memory (EEPROM), retaining the information through failure of primary and secondary power supplies.
 - b. Include a real-time clock for time annotation of events on the event recorder and printer.
2. Addressable initiation devices that communicate device identity and status.
 - a. Smoke sensors shall additionally communicate sensitivity setting and allow for adjustment of sensitivity at fire-alarm control unit.
 - b. Temperature sensors shall additionally test for and communicate the sensitivity range of the device.
3. Addressable control circuits for operation of mechanical equipment.

B. Alphanumeric Display and System Controls: Arranged for interface between human operator at fire-alarm control unit and addressable system components including annunciation and supervision. Display alarm, supervisory, and component status messages and the programming and control menu.

1. Annunciator and Display: Liquid-crystal type, 1, 2 or 3 line(s) of 40 or 80 characters, minimum.
2. Keypad: Arranged to permit entry and execution of programming, display, and control commands and to indicate control commands to be entered into the system for control of smoke-detector sensitivity and other parameters.

C. Circuits:

1. Initiating Device, Notification Appliance, and Signaling Line Circuits: NFPA 72, Class A.

- a. Initiating Device Circuits: Style D or Style E.
 - b. Notification Appliance Circuits: Style Z.
 - c. Signaling Line Circuits: Style 2, Style 5, Style 6 or Style 7.
 - d. Install no more than 50 addressable devices on each signaling line circuit.
2. Initiating Device, Notification Appliance, and Signaling Line Circuits: NFPA 72, Class B.
- a. Initiating Device Circuits: Style A, Style B or Style C.
 - b. Notification Appliance Circuits: Style W, Style X or Style Y.
 - c. Signaling Line Circuits: Style 0.5, Style 1, Style 3, Style 3.5, Style 4 or Style 4.5.
 - d. Install no more than 50 addressable devices on each signaling line circuit.
3. Serial Interfaces: Two RS-232 ports for printers.
- D. Stairwell Pressurization: Provide an output signal using an addressable relay to start the stairwell pressurization system. Signal shall remain on until alarm conditions are cleared and fire-alarm system is reset. Signal shall not stop in response to alarm acknowledge or signal silence commands.
- 1. Pressurization starts when any alarm is received at fire-alarm control unit.
 - 2. Alarm signals from smoke detectors at pressurization air supplies have a higher priority than other alarm signals that start the system.
- E. Smoke-Alarm Verification:
- 1. Initiate audible and visible indication of an "alarm-verification" signal at fire-alarm control unit.
 - 2. Activate an NRTL-listed and -approved "alarm-verification" sequence at fire-alarm control unit and detector.
 - 3. Record events by the system printer.
 - 4. Sound general alarm if the alarm is verified.
 - 5. Cancel fire-alarm control unit indication and system reset if the alarm is not verified.
- F. Notification Appliance Circuit: Operation shall sound as required.
- G. Elevator Recall:
- 1. Smoke detectors at the following locations shall initiate automatic elevator recall. Alarm-initiating devices, except those listed, shall not start elevator recall.
 - a. Elevator lobby detectors except the lobby detector on the designated floor.
 - b. Smoke detector in elevator machine room.
 - c. Smoke detectors in elevator hoistway.

2. Elevator lobby detectors located on the designated recall floors shall be programmed to move the cars to the alternate recall floor.
 3. Water-flow alarm connected to sprinkler in an elevator shaft and elevator machine room shall shut down elevators associated with the location without time delay.
 - a. Water-flow switch associated with the sprinkler in the elevator pit may have a delay to allow elevators to move to the designated floor.
- H. Door Controls: Door hold-open devices that are controlled by smoke detectors at doors in smoke barrier walls shall be or not be connected to fire-alarm system.
- I. Remote Smoke-Detector Sensitivity Adjustment: Controls shall select specific addressable smoke detectors for adjustment, display their current status and sensitivity settings, and change those settings. Allow controls to be used to program repetitive, time-scheduled, and automated changes in sensitivity of specific detector groups. Record sensitivity adjustments and sensitivity-adjustment schedule changes in system memory, and print out the final adjusted values on system printer.
- J. Transmission to Remote Alarm Receiving Station: Automatically transmit alarm, supervisory, and trouble signals to a remote alarm station.
- K. Voice/Alarm Signaling Service: Central emergency communication system with redundant microphones, preamplifiers, amplifiers, and tone generators provided in a separate cabinet located in the fire command center or as a special module that is part of fire-alarm control unit.
1. Indicated number of alarm channels for automatic, simultaneous transmission of different announcements to different zones or for manual transmission of announcements by use of the central-control microphone. Amplifiers shall comply with UL 1711 and be listed by an NRTL.
 - a. Allow the application of and evacuation signal to indicated number of zones and, at same time, allow voice paging to the other zones selectively or in any combination.
 - b. Programmable tone and message sequence selection.
 - c. Standard digitally recorded messages for "Evacuation" and "All Clear."
 - d. Generate tones to be sequenced with audio messages of type recommended by NFPA 72 and that are compatible with tone patterns of notification appliance circuits of fire-alarm control unit.
 2. Status Annunciator: Indicate the status of various voice/alarm speaker zones and the status of firefighters' two-way telephone communication zones.
 3. Preamplifiers, amplifiers, and tone generators shall automatically transfer to backup units, on primary equipment failure.
- L. Printout of Events: On receipt of signal, print alarm, supervisory, and trouble events. Identify zone, device, and function. Include type of signal (alarm, supervisory, or trouble) and date and time of occurrence. Differentiate alarm signals from all other printed indications. Also print system reset event, including same information for device, location, date, and time. Commands initiate the printing of a list of existing alarm, supervisory, and trouble conditions in the system and a historical log of events.

- M. Primary Power: 24-V dc obtained from 120-V ac service and a power-supply module. Initiating devices, notification appliances, signaling lines, trouble signals, supervisory signals, supervisory and digital alarm communicator transmitters and digital alarm radio transmitters shall be powered by 24-V dc source.
 - 1. Alarm current draw of entire fire-alarm system shall not exceed 80 percent of the power-supply module rating.
- N. Secondary Power: 24-V dc supply system with batteries, automatic battery charger, and automatic transfer switch.
 - 1. Batteries: Sealed lead calcium, sealed, valve-regulated, recombinant lead acid or Vented, wet-cell pocket, plate nickel cadmium.
- O. Instructions: Computer printout or typewritten instruction card mounted behind a plastic or glass cover in a stainless-steel or aluminum frame. Include interpretation and describe appropriate response for displays and signals. Briefly describe the functional operation of the system under normal, alarm, and trouble conditions.

2.4 MANUAL FIRE-ALARM BOXES

- A. General Requirements for Manual Fire-Alarm Boxes: Comply with UL 38. Boxes shall be finished in red with molded, raised-letter operating instructions in contrasting color; shall show visible indication of operation; and shall be mounted on recessed outlet box. If indicated as surface mounted, provide manufacturer's surface back box.
 - 1. Single-action mechanism, breaking-glass or plastic-rod or pull-lever type; with integral addressable module arranged to communicate manual-station status (normal, alarm, or trouble) to fire-alarm control unit.
 - 2. Double-action mechanism requiring two actions to initiate an alarm, breaking-glass or plastic-rod or pull-lever type; with integral addressable module arranged to communicate manual-station status (normal, alarm, or trouble) to fire-alarm control unit.
 - 3. Station Reset: Key- or wrench-operated switch.
 - 4. Indoor Protective Shield: Factory-fabricated clear plastic enclosure hinged at the top to permit lifting for access to initiate an alarm. Lifting the cover actuates an integral battery-powered audible horn intended to discourage false-alarm operation.
 - 5. Weatherproof Protective Shield: Factory-fabricated clear plastic enclosure hinged at the top to permit lifting for access to initiate an alarm.

2.5 SYSTEM SMOKE DETECTORS

- A. General Requirements for System Smoke Detectors:
 - 1. Comply with UL 268; operating at 24-V dc, nominal.
 - 2. Detectors shall be four or two-wire type.
 - 3. Integral Addressable Module: Arranged to communicate detector status (normal, alarm, or trouble) to fire-alarm control unit.

4. Base Mounting: Detector and associated electronic components shall be mounted in a twist-lock module that connects to a fixed base. Provide terminals in the fixed base for connection to building wiring.
5. Self-Restoring: Detectors do not require resetting or readjustment after actuation to restore them to normal operation.
6. Integral Visual-Indicating Light: LED type indicating detector has operated and power-on status.
7. Remote Control: Unless otherwise indicated, detectors shall be analog-addressable type, individually monitored at fire-alarm control unit for calibration, sensitivity, and alarm condition and individually adjustable for sensitivity by fire-alarm control unit.
 - a. Rate-of-rise temperature characteristic shall be selectable at fire-alarm control unit for 15 or 20 deg F per minute.
 - b. Fixed-temperature sensing shall be independent of rate-of-rise sensing and shall be settable at fire-alarm control unit to operate at 135 or 155 deg F.
 - c. Provide multiple levels of detection sensitivity for each sensor.

B. Photoelectric Smoke Detectors:

1. Detector address shall be accessible from fire-alarm control unit and shall be able to identify the detector's location within the system and its sensitivity setting.
2. An operator at fire-alarm control unit, having the designated access level, shall be able to manually access the following for each detector:
 - a. Primary status.
 - b. Device type.
 - c. Present average value.
 - d. Present sensitivity selected.
 - e. Sensor range (normal, dirty, etc.).

C. Ionization Smoke Detector:

1. Detector address shall be accessible from fire-alarm control unit and shall be able to identify the detector's location within the system and its sensitivity setting.
2. An operator at fire-alarm control unit, having the designated access level, shall be able to manually access the following for each detector:
 - a. Primary status.
 - b. Device type.
 - c. Present average value.
 - d. Present sensitivity selected.
 - e. Sensor range (normal, dirty, etc.).

D. Duct Smoke Detectors: Photoelectric type complying with UL 268A.

1. Detector address shall be accessible from fire-alarm control unit and shall be able to identify the detector's location within the system and its sensitivity setting.

2. An operator at fire-alarm control unit, having the designated access level, shall be able to manually access the following for each detector:
 - a. Primary status.
 - b. Device type.
 - c. Present average value.
 - d. Present sensitivity selected.
 - e. Sensor range (normal, dirty, etc.).
3. Weatherproof Duct Housing Enclosure: NEMA 250, Type 4X; NRTL listed for use with the supplied detector.
4. Each sensor shall have multiple levels of detection sensitivity.
5. Sampling Tubes: Design and dimensions as recommended by manufacturer for specific duct size, air velocity, and installation conditions where applied.
6. Relay Fan Shutdown: Rated to interrupt fan motor-control circuit.

2.6 NONSYSTEM SMOKE DETECTORS

A. Single-Station Smoke Detectors:

1. Comply with UL 217; suitable for NFPA 101, residential occupancies; operating at 120-V ac with 9-V dc battery as the secondary power source. Provide with "low" or "missing" battery chirping-sound device.
2. Auxiliary Relays: One Form C rated at 0.5 A or Form A and one Form C, both rated at 0.5 A.
3. Audible Notification Appliance: Piezoelectric sounder rated at 90 dBA at 10 feet according to UL 464.
4. Visible Notification Appliance: 177-cd strobe.
5. Heat sensor, 135 deg F combination rate-of-rise and fixed temperature.
6. Test Switch: Push to test; simulates smoke at rated obscuration.
7. Tandem Connection: Allow tandem connection of number of indicated detectors; alarm on one detector shall actuate notification on all connected detectors.
8. Plug-in Arrangement: Detector and associated electronic components shall be mounted in a plug-in module that connects to a fixed base. Provide terminals in the fixed base for connection to building wiring.
9. Self-Restoring: Detectors shall not require resetting or readjustment after actuation to restore them to normal operation.
10. Integral Visual-Indicating Light: LED type indicating detector has operated and power-on status.

B. Single-Station Duct Smoke Detectors:

1. Comply with UL 268A; operating at 120-V ac.
2. Sensor: LED or infrared light source with matching silicon-cell receiver.
 - a. Detector Sensitivity: Smoke obscuration between 2.5 and 3.5 percent/foot when tested according to UL 268A.

3. Base Mounting: Detector and associated electronic components shall be mounted in a twist-lock module that connects to a fixed base. The fixed base shall be designed for mounting directly to air duct. Provide terminals in the fixed base for connection to building wiring.
 - a. Weatherproof Duct Housing Enclosure: NEMA 250, Type 4X; NRTL listed for use with the supplied detector.
4. Sampling Tubes: Design and dimensions as recommended by manufacturer for specific duct size, air velocity, and installation conditions where applied.
5. Relay Fan Shutdown: Rated to interrupt fan motor-control circuit.

2.7 HEAT DETECTORS

- A. General Requirements for Heat Detectors: Comply with UL 521.
- B. Heat Detector, Combination Type: Actuated by either a fixed temperature of 135 deg F or a rate of rise that exceeds 15 deg F per minute unless otherwise indicated.
 1. Mounting: Adapter plate for outlet box mounting or Twist-lock base interchangeable with smoke-detector bases.
 2. Integral Addressable Module: Arranged to communicate detector status (normal, alarm, or trouble) to fire-alarm control unit.
- C. Heat Detector, Fixed-Temperature Type: Actuated by temperature that exceeds a fixed temperature of 190 deg F.
 1. Mounting: Adapter plate for outlet box mounting or Twist-lock base interchangeable with smoke-detector bases.
 2. Integral Addressable Module: Arranged to communicate detector status (normal, alarm, or trouble) to fire-alarm control unit.
- D. Continuous Linear Heat-Detector System:
 1. Detector Cable: Rated detection temperature 155 deg F. NRTL listed for "regular" service and a standard environment. Cable includes two steel actuator wires twisted together with spring pressure, wrapped with protective tape, and finished with PVC outer sheath. Each actuator wire is insulated with heat-sensitive material that reacts with heat to allow the cable twist pressure to short-circuit wires at the location of elevated temperature.
 2. Control Unit: Two-zone or multizone unit as indicated. Provide same system power supply, supervision, and alarm features as specified for fire-alarm control unit.
 3. Signals to Fire-Alarm Control Unit: Any type of local system trouble shall be reported to fire-alarm control unit as a composite "trouble" signal. Alarms on each detection zone shall be individually reported to central fire-alarm control unit as separately identified zones.

4. Integral Addressable Module: Arranged to communicate detector status (normal, alarm, or trouble) to fire-alarm control unit.

2.8 NOTIFICATION APPLIANCES

- A. General Requirements for Notification Appliances: Individually addressed, connected to a signaling line circuit, equipped for mounting as indicated and with screw terminals for system connections.
- B. General Requirements for Notification Appliances: Connected to notification appliance signal circuits, zoned as indicated, equipped for mounting as indicated and with screw terminals for system connections.
 1. Combination Devices: Factory-integrated audible and visible devices in a single-mounting assembly, equipped for mounting as indicated and with screw terminals for system connections.
- C. Chimes, Low-Level Output: Vibrating type, 75-dBA minimum rated output.
- D. Chimes, High-Level Output: Vibrating type, 81-dBA minimum rated output.
- E. Horns: Electric-vibrating-polarized type, 24-V dc; with provision for housing the operating mechanism behind a grille. Comply with UL 464. Horns shall produce a sound-pressure level of 90 dBA, measured 10 feet from the horn, using the coded signal prescribed in UL 464 test protocol.
- F. Visible Notification Appliances: Xenon strobe lights comply with UL 1971, with clear or nominal white polycarbonate lens mounted on an aluminum faceplate. The word "FIRE" is engraved in minimum 1-inch- high letters on the lens.
 1. Rated Light Output:
 - a. 15 30, 75, 110 or 177 cd.
 - b. 15/30/75/110 cd, selectable in the field.
 2. Mounting: Wall mounted unless otherwise indicated.
 3. For units with guards to prevent physical damage, light output ratings shall be determined with guards in place.
 4. Flashing shall be in a temporal pattern, synchronized with other units.
 5. Strobe Leads: Factory connected to screw terminals.
 6. Mounting Faceplate: Factory finished, red or white.
- G. Voice/Tone Notification Appliances:
 1. Appliances shall comply with UL 1480 and shall be listed and labeled by an NRTL.
 2. High-Range Units: Rated 2 to 15 W.
 3. Low-Range Units: Rated 1 to 2 W.
 4. Mounting: Flush, semi-recessed or surface mounted and bidirectional.

5. Matching Transformers: Tap range matched to acoustical environment of speaker location.

2.9 FIREFIGHTERS' TWO-WAY TELEPHONE COMMUNICATION SERVICE

- A. Dedicated, two-way, supervised, telephone voice communication links between fire-alarm control unit, the fire command center, and remote firefighters' telephone stations. Supervised telephone lines shall be connected to talk circuits by controls in a control module. Provide the following:
 1. Common-talk type for firefighter use only.
 2. Selective-talk type for use by firefighters and fire wardens.
 3. Controls to disconnect phones from talk circuits if too many phones are in use simultaneously.
 4. Audible Pulse and Tone Generator, and High-Intensity Lamp: When a remote telephone is activated, it causes audible signal to sound and high-intensity lamp to flash.
 5. Selector panel controls shall provide for simultaneous operation of up to six telephones in selected zones. Indicate ground faults and open or shorted telephone lines on the panel front by individual LEDs.
 6. Display: Graphic or Liquid-crystal digital to indicate location of caller.
 7. Remote Telephone Cabinet: Flush- or surface-mounted cabinet as indicated, factory-standard red finish, with handset.
 - a. Install one-piece handset to cabinet with vandal-resistant armored cord. Silk-screened or engraved label on cabinet door, designating "Fire Warden Phone" or "Fire Emergency Phone."
 - b. With "break-glass" type door access lock.
 8. Remote Telephone Jack Stations: Single-gang, stainless-steel-plate mounted plug, engraved "Fire Warden Phone" or "Fire Emergency Phone."
 9. Handsets: push-to-talk-type sets with noise-canceling microphone stored in a cabinet adjacent to fire-alarm control unit or in the fire command center.

2.10 MAGNETIC DOOR HOLDERS

- A. Description: Units are equipped for wall or floor mounting as indicated and are complete with matching doorplate.
 1. Electromagnet: Requires no more than 3 W to develop 25-lbf holding force.
 2. Wall-Mounted Units: Flush mounted unless otherwise indicated.
 3. Rating: 24-V ac or dc.
 4. Rating: 120-V ac.
- B. Material and Finish: Match door hardware.

2.11 REMOTE ANNUNCIATOR

- A. Description: Annunciator functions shall match those of fire-alarm control unit for alarm, supervisory, and trouble indications. Manual switching functions shall match those of fire-alarm control unit, including acknowledging, silencing, resetting, and testing.
 - 1. Mounting: Flush or Surface cabinet, NEMA 250, Type 1.
- B. Display Type and Functional Performance: Alphanumeric display and LED indicating lights shall match those of fire-alarm control unit. Provide controls to acknowledge, silence, reset, and test functions for alarm, supervisory, and trouble signals.

2.12 ADDRESSABLE INTERFACE DEVICE

- A. Description: Microelectronic monitor module, NRTL listed for use in providing a system address for alarm-initiating devices for wired applications with normally open contacts.
- B. Integral Relay: Capable of providing a direct signal to elevator controller to initiate elevator recall or to circuit-breaker shunt trip for power shutdown.

2.13 DIGITAL ALARM COMMUNICATOR TRANSMITTER

- A. Digital alarm communicator transmitter shall be acceptable to the remote central station and shall comply with UL 632 and be listed and labeled by an NRTL.
- B. Functional Performance: Unit shall receive an alarm, supervisory, or trouble signal from fire-alarm control unit and automatically capture one or two telephone line(s) and dial a preset number for a remote central station. When contact is made with central station(s), signals shall be transmitted. If service on either line is interrupted for longer than 45 seconds, transmitter shall initiate a local trouble signal and transmit the signal indicating loss of telephone line to the remote alarm receiving station over the remaining line. Transmitter shall automatically report telephone service restoration to the central station. If service is lost on both telephone lines, transmitter shall initiate the local trouble signal.
- C. Local functions and display at the digital alarm communicator transmitter shall include the following:
 - 1. Verification that both telephone lines are available.
 - 2. Programming device.
 - 3. LED display.
 - 4. Manual test report function and manual transmission clear indication.
 - 5. Communications failure with the central station or fire-alarm control unit.
- D. Digital data transmission shall include the following:
 - 1. Address of the alarm-initiating device.
 - 2. Address or Zone of the supervisory signal.
 - 3. Address or Zone of the trouble-initiating device.

4. Loss of ac supply or loss of power.
 5. Low battery.
 6. Abnormal test signal.
 7. Communication bus failure.
- E. Secondary Power: Integral rechargeable battery and automatic charger.
- F. Self-Test: Conducted automatically every 24 hours with report transmitted to central station.

2.14 RADIO ALARM TRANSMITTER

- A. Transmitter shall comply with NFPA 1221 and shall be listed and labeled by an NRTL.
- B. Comply with 47 CFR 90.
- C. Description: Manufacturer's standard commercial product; factory assembled, wired, tested, and ready for installation and operation.
1. Packaging: A single, modular, NEMA 250, Type 1 metal enclosure with a tamper-resistant flush tumbler lock.
 2. Signal Transmission Mode and Frequency: VHF or UHF 2-W power output, coordinated with operating characteristics of the established remote alarm receiving station designated by Owner.
 3. Normal Power Input: 120-V ac.
 4. Secondary Power: Integral-sealed, rechargeable, 12-V battery and charger. Comply with NFPA 72 requirements for battery capacity; submit calculations.
 5. Antenna: Omnidirectional, coaxial half-wave, dipole type with driving point impedance matched to transmitter and antenna cable output impedance. Wind-load strength of antenna and mounting hardware and supports shall withstand 100 mph with a gust factor of 1.3 without failure.
 6. Antenna Cable: Coaxial cable with impedance matched to the transmitter output impedance.
 7. Antenna-Cable Connectors: Weatherproof.
 8. Alarm Interface Devices: Circuit boards, modules, and other auxiliary devices, integral to the transmitter, matching fire-alarm and other system outputs to message-generating inputs of the transmitter that produce required message transmissions.
- D. Functional Performance: Unit shall receive an alarm, supervisory, or trouble signal from fire-alarm control unit or from its own internal sensors or controls and shall automatically transmit signal along with a unique code that identifies the transmitting station to the remote alarm receiving station. Transmitted messages shall correspond to standard designations for fire-reporting system to which the signal is being transmitted and shall include separately designated messages in response to the following events or conditions:
1. Transmitter Low-Battery Condition: Sent when battery voltage is below 85 percent of rated value.
 2. System Test Message: Initiated manually by a test switch within the transmitter cabinet, or automatically at an optionally preselected time, once every 24 hours, with transmission time controlled by a programmed timing device integral to transmitter controls.

3. Transmitter Trouble Message: Actuated by failure, in excess of one-minute duration, of the transmitter normal power source, derangement of the wiring of the transmitter, or any alarm input interface circuit or device connected to it.
4. Local Fire-Alarm-System Trouble Message: Initiated by events or conditions that cause a trouble signal to be indicated on the building system.
5. Local Fire-Alarm-System Alarm Message: Actuated when the building system goes into an alarm state. Identifies device that initiated the alarm.
6. Local Fire-Alarm-System Supervisory-Alarm Message: Actuated when the building alarm system indicates a supervisory alarm.

2.15 SYSTEM PRINTER

- A. Printer shall be listed and labeled by an NRTL as an integral part of fire-alarm system.

2.16 DEVICE GUARDS

- A. Description: Welded wire mesh of size and shape for the manual station, smoke detector, gong, or other device requiring protection.
 1. Factory fabricated and furnished by manufacturer of device.
 2. Finish: Paint of color to match the protected device.

PART 3 - EXECUTION

3.1 EQUIPMENT INSTALLATION

- A. Comply with NFPA 72 for installation of fire-alarm equipment.
- B. Equipment Mounting: Install fire-alarm control unit on concrete base with tops of cabinets not more than 72 inches above the finished floor. Comply with requirements for concrete base specified in Section 033000 "Cast-in-Place Concrete."
 1. Install seismic bracing. Comply with requirements in Section 260548 "Vibration and Seismic Controls for Electrical Systems."
 2. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch centers around the full perimeter of concrete base.
 3. For supported equipment, install epoxy-coated anchor bolts that extend through concrete base and anchor into structural concrete floor.
 4. Place and secure anchorage devices. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
 5. Install anchor bolts to elevations required for proper attachment to supported equipment.

- C. Equipment Mounting: Install fire-alarm control unit on finished floor with tops of cabinets not more than 72 inches above the finished floor.
 - 1. Comply with requirements for seismic-restraint devices specified in Section 260548 "Vibration and Seismic Controls for Electrical Systems."
- D. Install wall-mounted equipment, with tops of cabinets not more than 72 inches above the finished floor.
 - 1. Comply with requirements for seismic-restraint devices specified in Section 260548 "Vibration and Seismic Controls for Electrical Systems."
- E. Connecting to Existing Equipment: Verify that existing fire-alarm system is operational before making changes or connections.
 - 1. Connect new equipment to existing control panel in existing part of the building.
 - 2. Connect new equipment to existing monitoring equipment at the supervising station.
 - 3. Expand, modify, and supplement existing control monitoring equipment as necessary to extend existing control or monitoring functions to the new points. New components shall be capable of merging with existing configuration without degrading the performance of either system.
- F. Smoke- or Heat-Detector Spacing:
 - 1. Comply with NFPA 72, "Smoke-Sensing Fire Detectors" Section in the "Initiating Devices" Chapter, for smoke-detector spacing.
 - 2. Comply with NFPA 72, "Heat-Sensing Fire Detectors" Section in the "Initiating Devices" Chapter, for heat-detector spacing.
 - 3. Smooth ceiling spacing shall not exceed 30 feet.
 - 4. Spacing of detectors for irregular areas, for irregular ceiling construction, and for high ceiling areas shall be determined according to Appendix A or Appendix B in NFPA 72.
 - 5. HVAC: Locate detectors not closer than 3 feet or 5 feet from air-supply diffuser or return-air opening.
 - 6. Lighting Fixtures: Locate detectors not closer than 12 inches from any part of a lighting fixture.
- G. Duct Smoke Detectors: Comply with NFPA 72 and NFPA 90A. Install sampling tubes so they extend the full width of duct.
- H. Heat Detectors in Elevator Shafts: Coordinate temperature rating and location with sprinkler rating and location.
- I. Single-Station Smoke Detectors: Where more than one smoke alarm is installed within a dwelling or suite, they shall be connected so that the operation of any smoke alarm causes the alarm in all smoke alarms to sound.
- J. Remote Status and Alarm Indicators: Install near each smoke detector and each sprinkler water-flow switch and valve-tamper switch that is not readily visible from normal viewing position.

- K. Audible Alarm-Indicating Devices: Install not less than 6 inches below the ceiling. Install bells and horns on flush-mounted back boxes with the device-operating mechanism concealed behind a grille.
- L. Visible Alarm-Indicating Devices: Install adjacent to each alarm bell or alarm horn and at least 6 inches below the ceiling.
- M. Device Location-Indicating Lights: Locate in public space near the device they monitor.
- N. Fire-Alarm Control Unit: Surface mounted, with tops of cabinets not more than 72 inches above the finished floor.
- O. Annunciator: Install with top of panel not more than 72 inches above the finished floor.
- P. Antenna for Radio Alarm Transmitter: Mount to building structure where indicated. Use mounting arrangement and substrate connection that will resist 100-mph wind load with a gust factor of 1.3 without damage.

3.2 CONNECTIONS

- A. For fire-protection systems related to doors in fire-rated walls and partitions and to doors in smoke partitions, comply with requirements in Section 087100 "Door Hardware." Connect hardware and devices to fire-alarm system.
 - 1. Verify that hardware and devices are NRTL listed for use with fire-alarm system in this Section before making connections.
- B. Make addressable connections with a supervised interface device to the following devices and systems. Install the interface device less than 3 feet from the device controlled. Make an addressable confirmation connection when such feedback is available at the device or system being controlled.
 - 1. Alarm-initiating connection to smoke-control system (smoke management) at firefighter smoke-control system panel.
 - 2. Alarm-initiating connection to stairwell and elevator-shaft pressurization systems.
 - 3. Smoke dampers in air ducts of designated air-conditioning duct systems.
 - 4. Alarm-initiating connection to elevator recall system and components.
 - 5. Alarm-initiating connection to activate emergency lighting control.
 - 6. Alarm-initiating connection to activate emergency shutoffs for gas and fuel supplies.
 - 7. Supervisory connections at valve supervisory switches.
 - 8. Supervisory connections at low-air-pressure switch of each dry-pipe sprinkler system.
 - 9. Supervisory connections at elevator shunt trip breaker.
 - 10. Supervisory connections at fire-pump power failure including a dead-phase or phase-reversal condition.
 - 11. Supervisory connections at fire-pump engine control panel.

3.3 IDENTIFICATION

- A. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Section 260553 "Identification for Electrical Systems."
- B. Install framed instructions in a location visible from fire-alarm control unit.

3.4 GROUNDING

- A. Ground fire-alarm control unit and associated circuits; comply with IEEE 1100. Install a ground wire from main service ground to fire-alarm control unit.

3.5 FIELD QUALITY CONTROL

- A. Field tests shall be witnessed by authorities having jurisdiction and Owner.
- B. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections.
- C. Perform tests and inspections.
 - 1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.
- D. Tests and Inspections:
 - 1. Visual Inspection: Conduct visual inspection prior to testing.
 - a. Inspection shall be based on completed Record Drawings and system documentation that is required by NFPA 72 in its "Completion Documents, Preparation" Table in the "Documentation" Section of the "Fundamentals of Fire Alarm Systems" Chapter.
 - b. Comply with "Visual Inspection Frequencies" Table in the "Inspection" Section of the "Inspection, Testing and Maintenance" Chapter in NFPA 72; retain the "Initial/Reacceptance" column and list only the installed components.
 - 2. System Testing: Comply with "Test Methods" Table in the "Testing" Section of the "Inspection, Testing and Maintenance" Chapter in NFPA 72.
 - 3. Test audible appliances for the public operating mode according to manufacturer's written instructions. Perform the test using a portable sound-level meter complying with Type 2 requirements in ANSI S1.4.
 - 4. Test audible appliances for the private operating mode according to manufacturer's written instructions.
 - 5. Test visible appliances for the public operating mode according to manufacturer's written instructions.

6. Factory-authorized service representative shall prepare the "Fire Alarm System Record of Completion" in the "Documentation" Section of the "Fundamentals of Fire Alarm Systems" Chapter in NFPA 72 and the "Inspection and Testing Form" in the "Records" Section of the "Inspection, Testing and Maintenance" Chapter in NFPA 72.

E. Reacceptance Testing: Perform reacceptance testing to verify the proper operation of added or replaced devices and appliances.

F. Fire-alarm system will be considered defective if it does not pass tests and inspections.

G. Prepare test and inspection reports.

H. Maintenance Test and Inspection: Perform tests and inspections listed for weekly, monthly, quarterly, and semiannual periods. Use forms developed for initial tests and inspections.

I. Annual Test and Inspection: One year after date of Substantial Completion, test fire-alarm system complying with visual and testing inspection requirements in NFPA 72. Use forms developed for initial tests and inspections.

3.6 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain fire-alarm system.

END OF SECTION 283111

SECTION 283333- TANK LEAK DETECTION SYSTEM

PART 1 - GENERAL

1.1 SCOPE

- A. This Section includes the provision of all materials, labor and tools necessary to provide a complete underground tank monitoring and leak detection system for the underground fuel oil storage tank and leak detection system for the underground fuel oil piping included in this project. The system shall have enough capacity to monitor two additional two tanks with associated underground fuel oil piping in the event these are added in the future.

1.2 QUALIFICATIONS

- A. The system installer shall be certified by the system manufacturer to install, calibrate and program the specified tank monitoring system and shall submit certification documentation with the tank monitoring system shop drawings.

1.3 GENERAL REQUIREMENTS

- A. The underground fuel oil storage tank monitor and leak detection system, hereinafter referred to as “the system” shall perform in accordance with Subpart D of 40 CFR 280.
- B. The system shall meet all applicable standards and regulatory agency requirements including but not limited to ANSI, API, ASTM, EPA NBS, NEC, NFPA, UL, FM and Underground Storage Tanks: Subpart D, 40 CFR Part 280.
- C. The system shall be a Veeder-Root Company TLS-350 UST Monitoring System or approved equal.
- D. In-Tank Leak Detection:
 - 1. The system shall utilize in-tank probes based on the magnetostrictive principle for liquid level measurement and in-tank leak detection.
 - 2. The tank gauge shall be capable of performing a static tank tightness test to an accuracy of 0.1 gph with at least a 98 percent probability of detection [P(D)] and no more than 1 percent probability of false alarm [P(FA)].
 - 3. The system shall have the ability to conduct automatic continuous statistical leak detection tests without the need to shut down tanks for scheduled test times.

E. Interstitial Leak Detection:

1. The system shall perform automatic, continuous leak sensing by monitoring the liquid level in the reservoir of the brine-filled interstitial space of the underground fuel oil storage tank to detect a breach in the inner or outer shell.
2. The system shall differentiate between a high liquid level and a low liquid level in the brine reservoir of the tanks and provide a high liquid alarm or low liquid alarm.

F. Pipe Sump Monitoring:

1. The system shall perform automatic continuous leak sensing of the underground fuel oil piping in the piping sump above each tank, shall detect the presence of fluid in the piping sump and shall provide an alarm condition.

G. Environmental Compliance Reports:

1. The system shall provide a record of the last three occurrences of each type of alarm or warning condition detected by the system.
2. The system shall provide the following types of reports related to environmental compliance matters:
 - a. System status messages.
 - b. In-tank warning and alarm messages
 - c. In-tank tightness evaluation report.
 - d. Normally-closed sensor warning and alarm conditions.
 - e. Hydrostatic sensor warning and alarm conditions, high or low liquid level conditions.
 - f. Line leak detector warning and alarm conditions.
 - g. Software module alarm message.

H. Product Inventory Control: The system shall collect product height and temperature data from the one magnetostrictive level sensor and compute gross and temperature-compensated net gallons.

1. The system shall automatically generate an inventory increase report when a delivery of product has taken place. The report shall include the time and date of the delivery, the starting volume in the tank, the ending volume in the tank, the starting temperature of the fuel, the ending temperature of the fuel, and the inventory increase amount.

I. Inventory Management Reports:

1. The system shall monitor inventory in U.S. gallons for the one tank plus two future tanks and produce a combination of automatic and manual reports for each tank which include the following information:

- a. Fuel volume.
 - b. Fuel height.
 - c. Water height.
 - d. Fuel temperature.
 - e. Ullage.
 - f. Temperature-compensated fuel volume.
 - g. Last inventory increase amount.
 - h. Last in-tank leak test results.
 - i. Time and date.
 - j. Tank identification.
 - k. Fuel type identification.
 - l. 90 percent ullage.
2. A printout of the inventory status shall be generated any time the operator presses the print button while the system is in the normal operating mode.
 3. The system shall provide an automatic delivery report after bulk delivery is complete. The information shall include product label, date, starting and ending time, starting and ending volumes, temperature of the fuel and net volume increase.

J. Input/Output Devices

1. The system shall interface up to three relay output modules with four contact relays per module for a total of 12 relays to enable the external audible/visual alarms or control external devices.
2. The system shall interface up to three input/output combination modules with two contact relays per input/output module for a total of six inputs and six outputs/alarms.
3. The system shall provide an audible and visual indication of all system, in-tank leak, product line leak and external sensor alarm conditions.
4. The alarm conditions shall include:
 - a. Maximum product level.
 - b. High level limit.
 - c. Overfill alarm.
 - d. High water alarm.
 - e. Second high water alarm.
 - f. Delivery needed alarm.
 - g. Low limit.
 - h. Theft.
 - i. Periodic warning and alarm.
 - j. Annual warning and alarm.

K. Setup:

1. The system shall contain parameter-driven software to adapt the tank monitor to site specifications.
2. The system shall require the use of a security code to prohibit unauthorized entry to the system setup parameters.

L. Diagnostics:

1. All diagnostic information shall be generated by the system itself. The system shall not allow the user to change or enter diagnostic information in any way. The following diagnostic information shall be included:
 - a. Probe diagnostics.
 - b. System diagnostics.
 - c. In-tank diagnostics.
 - d. In-tank leak results.
 - e. Liquid sensor diagnostics.
 - f. Alarm history report.

M. Communication:

1. The System shall be designed to communicate with the steam plant automation system in order to provide remote monitoring of the input/output information.

PART 2 - PRODUCTS

2.1 CONSOLE

- A. The console shall be wall mounted and equipped with a two-line, 24-character liquid crystal display for on-site viewing of all inventory, leak detection and alarm information. The unit shall be a 24-button front panel keyboard with control and alphanumeric functions for programming, operating and reporting functions.
- B. The console shall have an integral 24-character thermal report printer with built-in take-up spool for hard-copy documentation of inventory, leak detect, and alarm information.
- C. The console shall be equipped with a back-up battery to maintain all programming, inventory, leak detect and alarm information in the event of a power outage.
- D. The console shall be divided into three compartments to separate and house plug-in modules for intrinsically safe devices, high power devices and communications devices.

2.2 MODULES

- A. The system shall be of modular design to allow the factory installation of system features to meet specific application requirements and field installation/modification of features at a later date.
- B. The system shall have the ability to contain up to three modules in the high power area and three modules in the communications area of the console.
- C. The system shall have the ability to contain up to three modules in the intrinsically safe area of the console. The system shall be provided with the following modules in this area:
 - 1. One four-input probe modules compatible with the magnetostrictive probes.
 - 2. One eight-input sensor interface modules compatible with sump and interstitial float switch sensors.

2.3 TANK PROBES

- A. Provide one Veeder-Root Model No. 847390-109 magnetostrictive probe for inventory control and tank tightness testing with water detection. Probe shall have third party certification in accordance with U.S. EPA's "Standard Test Procedure for Evaluating Leak Detection methods: Automatic Tank Gauging Systems" (0.2 gph monthly monitoring) and "Volumetric Tank Tightness Testing Method" (0.1 gph annual tank tightness test).
- B. Probe shall utilize standard non-shielded gas and oil resistant wire for field connections. No more than two conductors between the probe and the console shall be required.
- C. Provide a cap and ring kit with each probe.

2.4 SENSORS

- A. The system shall provide the ability to monitor up to 24 interstitial and/or containment areas utilizing a standard float style sensor.
- B. Provide one Veeder-Root Model No. 794380-208 piping sump sensor. Sensor shall be PVC Schedule 40 construction utilizing a float and reed switch to sense the presence of liquid. Sensor shall be supplied with a PVC monitoring sleeve for mounting in the piping sump.
- C. Provide one Veeder-Root Model No. 794380-303 tank reservoir sensor. Sensor shall be dual float type consisting of high level and low level liquid float switches, a lockable, watertight riser pipe cap with vent tube, and cable. Sensor shall utilize a dual float and reed switch assembly for sensing the presence and change in the liquid level. The contact shall be a normally closed dry contact.

2.5 REMOTE OVERFILL ALARM AND ACKNOWLEDGEMENT SWITCH

- A. Provide a Veeder-Root remote overflow alarm and alarm acknowledgement switch. The alarm shall include a flashing red visual alarm and an audible alarm which are actuated by an alarm contact from the TLS-350 system. The overflow alarm limits for each tank shall be programmable and set from the TLS-350 console. The audible alarm shall have an adjustable "time on" and adjustable noise level.
- B. The alarm acknowledgement switch shall include a push-button and acknowledgement lamp. The push-button shall turn off the alarm while actuating the acknowledgement lamp.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. The system shall be installed per the system manufacturer's recommendations.

3.2 FIELD SERVICE

- A. The distributor/contractor field service representative shall provide a minimum of 24 manhours of on-site training of the Owner's operating and maintenance personnel on installation, programming and troubleshooting of the tank monitoring system.

3.3 WARRANTY AND CHECKOUT

- A. The distributor/contractor field service representative shall complete the manufacturer's Warranty Registration and Checkout Form for installation checkout, operation checkout and training on use of the equipment. Upon completion of the project, the form shall be submitted to the Owner.

END OF SECTION 283333