

SECTION 28 20 00

VIDEO SURVEILLANCE

PART 1 - GENERAL

1.1 DESCRIPTION

- A. This Section covers video surveillance systems.
- B. The video surveillance system shall consist of an expansion of the existing Exacq video surveillance system.
- C. The video surveillance system shall consist of IP video cameras, network video recorders and video surveillance workstations communication via the campus local area network.

1.2 RELATED SECTIONS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.
- B. Additional related specification sections include:
 - 1. Section 280500, Common Work Results for Electronic Security.
 - 2. Section 280513, Conductors and Cables for Electronic Security.
 - 3. Section 280528, Pathways for Electronic Security.
 - 4. Section 280800, Commissioning of Electronic Security.
 - 5. Section 281000, Access Control.
 - 6. Section 283100, Intrusion Detection.

1.3 QUALITY ASSURANCE

- A. The video surveillance system contractor, the contractor's supervisors, and technicians shall meet the qualifications as defined in Section 280500, Common Work Results for Electronic Security Systems.
- B. Qualifications of Contractor:
 - 1. The video surveillance system installation company shall have field office located within a 100-mile radius of the Project with a minimum of two permanently employed persons with current video management system certification directly responsible for the installation and ongoing maintenance of the project.
 - 2. Installation of the video surveillance system shall be provided by a person or persons having completed, as a minimum, the factory training recommended by the video management system manufacturer and have direct field experience in the installation of a minimum of 3 projects of similar scope and size within the past 5 years.
 - 3. The video surveillance system Project Manager or Project Supervisor shall have direct field experience in the installation of a minimum of 3 video surveillance systems projects of similar scope and size within the past 5 years.
 - 4. Programming and configuration of the video surveillance system shall be provided onsite by a person or persons having completed the video management system manufacturer's highest available certification program and have direct field

experience in the programming and configuration of a minimum of 3 projects of similar scope and size within the past 5 years.

5. The video surveillance system installation company shall be a currently listed as an authorized dealer or business partner by the manufacturer of the video management system and shall have been listed as such for a minimum of 3 years.

1.4 SUBMITTALS

- A. See Section 280500, Common Work Results for Electronic Security for additional requirements.
- B. Action Submittals:
 1. Product Data:
 - a) Provide product data sheets for equipment, materials, and cables in PDF format.
 2. Shop Drawings:
 - a) Include site and floor plans indicating equipment locations. Plans shall include equipment identification and either direct references to wiring details for each specific installation and wiring condition or a schedule that references the same.
 - b) Wiring diagrams shall indicate proposed connections of equipment, model numbers, and designations for cables and termination points.
 - c) Provide elevations of console or rack-mounted equipment, showing the location of all specified electronics and include enlarged, to scale plan (top), and front views.
 - d) Provide project specific manufacturer shop drawings of fabricated or modified units, if any.
 - e) Provide riser diagrams indicating components of the system and proposed cabling between these components.
 - f) Provide block diagrams indicating the proposed interface between the video surveillance system and the access control system. Provide a written description of the proposed sequence of operation to describe the operation of the interfaces.
 - g) Provide detailed project specific mounting diagram for each type of device including raceway and back box requirements. These details shall be referenced on the floor plans or schedules.
 - h) Provide a detailed loading schedule for each video surveillance network switch, patch panel, network video server recorder, and other head-end equipment identifying each device connected to it.
- C. Informational Submittals:
 1. Resumes of key personnel that documents the qualifications required. Include certificate of training or certifications.
 2. As required in Section 280500, Common Work Results for Electronic Security.
- D. Close-out Submittals:

1. Functional Test Reports: Provide a spreadsheet with all video surveillance system devices and major components listed in the first column by device designator (e.g., camera number) with each test parameter listed by name (or code) in the remaining columns.
2. Operations and Maintenance Documentation Package: As defined in Section 280500, Common Work Results for Electronic Security.
3. Instruction of Operating Personnel:
 - a) The Security Systems Performance Verification Supervisor shall schedule, coordinate, assemble and deliver the documentation of the training required by this section.
 - b) Obtain receipt from the Owner acknowledging completion of each item of instruction.
 - c) See Section 280500, Common Work Results for Electronic Security for additional requirements.

PART 2 - PRODUCTS

2.1 GENERAL

- A. Unless otherwise specified herein, quantities of equipment are indicated on the Drawings.
- B. Provide compatible components. Provide IP cameras that are manufacturer certified compatible with the video management system software provided.

2.2 VIDEO CAMERAS AND ACCESSORIES

- A. Video cameras shall have the following minimum features:
 1. Signal and scanning systems: NTSC color.
 2. Image sensor: progressive scan CCD or CMOS sensor, 0.33" or larger.
 3. For 180° multi-sensor cameras: provide 3 or 4 separate 3.0 megapixel image sensors in dome enclosure.
 4. For 180° multi-sensor cameras: provide 3 or 4 separate 5.0 megapixel image sensors in dome enclosure.
 5. For 180° multi-sensor cameras: provide 3 or 4 separate 8.0 megapixel image sensors in dome enclosure.
 6. For 270° multi-sensor cameras: provide 3 or 4 separate 3.0 megapixel image sensors in dome enclosure.
 7. For 270° multi-sensor cameras: provide 3 or 4 separate 5.0 megapixel image sensors in dome enclosure.
 8. For 270° multi-sensor cameras: provide 3 or 4 separate 8.0 megapixel image sensors in dome enclosure.
 9. For 360° multi-sensor cameras: provide 4 separate 3.0 megapixel image sensors in dome enclosure.
 10. For 360° multi-sensor cameras: provide 4 separate 5.0 megapixel image sensors in dome enclosure.
 11. For 360° multi-sensor cameras: provide 4 separate 8.0 megapixel image sensors in dome enclosure.

12. Provide day/night (color/monochrome with IR filter removal) type cameras for outdoor areas.
 13. Digital processing with automatic white balance, automatic gain control, electronic shutter control, and backlight compensation.
 14. Event triggers: video motion detection (internal), active tampering alarm, and external input.
 15. Event actions: pre- and post-alarm video buffering, and activation of (relay) external output.
 16. Dynamic range: minimum 65 dB., except camera types specified to have wide dynamic range shall have a minimum of 100 dB dynamic range.
 17. Network interface: Ethernet 100 BaseT.
 18. Supported protocols: TCP/IP, UDP/IP, DHCP, HTTP, Multicast, PPPoE, RTP, and RTSP.
 19. Security: SSL-based authentication.
 20. ONVIF Profile S compliant (www.onvif.org).
 21. Compression: H.265, H.264 Baseline and Main Profile (MPEG-4 Part 10/AVC), and Motion JPEG, each stream independently selectable and capable of being transmitted to separate locations.
 22. VBR (variable bitrate) or CBR (constant bitrate) encoding format selectable to correspond with various network conditions.
 23. Lens: varifocal, remote focus and control, auto-iris control, IR corrected, and designed for camera's megapixel resolution. For pan-tilt-zoom cameras: auto iris and auto focus, IR corrected, 20X minimum zoom lens.
 24. Minimum illumination sensitivity requirements (50 IRE):
 - a) Non-low-light cameras: using wide angle lens (3-9 mm); 0.4 lux (F1.2) in color mode, 0.03 lux (F1.2) in monochrome mode; using telephoto lens; 0.6 lux (F1.2) in color mode, 0.06 lux (F1.2) in monochrome mode.
 - b) Low light cameras: minimum illumination: 0.04 lux (F1.2) in color mode; 0.008 fc (F1.2) in monochrome mode.
 - c) For IR capable cameras: 0.0 lux (F1.2) when infrared illuminators are switched on.
 25. Frame rate at maximum resolution: capable of 30 frames or images per second.
 26. External I/O terminals: alarm input, alarm output.
 27. Event triggers: video motion detection (internal), active tampering alarm, and external input.
 28. Where required provide built-in 850 nm LED infrared (IR) illuminator with 100' range for wide angle lens, and 200' range for telephoto lens.
 29. Power: IEEE 802.3 2018 (AMD 2018) or compliant PoE.
- B. Camera Enclosures and Mounting Hardware:
1. Style: Dome.
 2. Color: Color of non-transparent portions of the camera housing (normally black or white) shall be that color which most closely matches the surface to which the camera is to be mounted. Transparent portion of dome or bullet shall be clear glass or polycarbonate.
 3. For cameras located in environmentally controlled areas (indoors) enclosures and mounting hardware shall have the following minimum features:

- a) Compatible with the camera and lens provided.
 - b) Operating range from 14°F to 100°F
 - c) IK10 rated for impact resistant.
 - d) Enclosures and mounting hardware of the style and type indicated on the Drawings.
4. For each camera located in an environmentally uncontrolled area (outdoors), enclosures and appropriate mounting hardware shall have the following minimum features:
- a) Compatible with the camera, lens, and pan-tilt drive provided.
 - b) Operating range from -22°F to 140°F.
 - c) IP66 or NEMA 4X rated enclosure.
 - d) IK10 rated for impact resistant.
 - e) Sunshield where the video camera is exposed to direct sun.
 - f) Enclosures and mounting hardware of the style and type indicated on the Drawings.
- C. Manufacturer: Axis or approved equal.

2.3 NETWORK-BASED VIDEO SURVEILLANCE SYSTEMS

- A. General:
- 1. The video surveillance system shall receive video signals over a local area network or wide area network from IP video cameras directly connected to the network.
 - 2. The NVMS shall not limit the storage capacity and shall allow for upgrades of recording capacity.
 - 3. Network Video Management System Software (NVMS):
 - 4. General:
 - a) The NVMS shall be the latest version of the existing software.
 - b) The NVMS shall consist of server software applications and client software applications.
 - 5. Manufacturer: ExacqVision.
- B. Video Analytics Engines:
- 1. The applications software shall be designed for the automated detection of targeted behaviors based on fully scalable, rules-based video content analytics with the following minimum features:
 - a) The video analytics engine shall be able to distinguish between moving foreground objects and moving background objects. Examples of moving background objects include leaves and trees blowing in the wind, water fountains, or ocean waves.
 - b) The video analytics engine shall be able to adapt to changes in the environment automatically, such as lighting changes (clouds passing in front of the sun), weather, changes in the seasons, or the camera being aimed in a different direction without any manual adjustments. The video analytics engine shall be able to automatically adapt to lighting changes due to auto-iris adjustments, or changes from day mode to night mode in the camera, within

6 seconds or less without creating false alarms. The video analytics engine shall continue to accurately detect with low false alarm rates even in conditions of bad weather, such as snow, rain, hail, fog, as long as objects can be seen.

- c) The video analytics engine shall include self-learning capabilities, so that it can automatically learn the scene environment in less than 2 minutes after being powered on, and then begin detecting immediately afterwards. The video analytics engine shall automatically learn highly dynamic backgrounds, such as water rippling, leaves blowing in the wind, water fountains and escalators.
- d) The video analytics engine shall use pattern matching, rather than pixel differentiating techniques, to identify objects of interest.
- e) The video analytics engine shall compensate for camera vibration.
- f) The video analytics engine shall be able to track objects of interest accurately even when there is highly dynamic background motion in the scene. The video analytics engine shall not lose track of objects when they cross paths with other moving objects. The video analytics engine shall continue to track objects when they change from side views to front views, or vice versa.
- g) Management and configuration of cameras shall be done through a GUI-based configuration. The video analytics engine shall send alerts to client workstations as well as the ability to push alerts to mobile devices.
- h) The video analytics engine shall create and store a metadata record of all the objects it sees, so that video can quickly and easily be searched later by object's appearance, or other rule violations determined later.

2.4 MISCELLANEOUS EQUIPMENT

- A. Power supplies: Sized to accommodate video cameras and devices provided with a 25% margin for future expansion, and shall have the following features:
 - 1. Compliance with UL 2044-2019
 - 2. 120 V AC input.
 - 3. One individually fused output per camera.
 - 4. Contained in a hinged and lockable NEMA 1 enclosure.
 - 5. Cabinet tamper switch.
 - 6. Battery back-up.
 - 7. Manufacturer: Alarm-Saf, or Altronix.
- B. Poles:
 - 1. General: round square straight tapered steel poles for supporting cameras.
 - 2. Poles height as shown on drawings.
 - 3. Poles shall be rated for an effective projected area of 9 ft² in sustained winds of 90 mph, and a weight of 75 lb.
 - 4. Poles shall have factory-installed internal vibration dampers, and a 2-piece cast aluminum full base cover.
 - 5. Finish: galvanized. paint to match existing lighting poles.
 - 6. Manufacturer: Crouse-Hinds, U.S. Pole, or Valmont.

PART 3 - EXECUTION**3.1 GENERAL**

- 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.
- D. Systems shall be installed by skilled craftsmen in a manner conforming to industry standards for the craft.
- E. 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.
- F. Provide a written report of adjustments and recommendations.

3.2 WIRING

- A. 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.
- B. 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.
- C. 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.
- D. Grounding: Provide independent-signal circuit grounding recommended in writing by manufacturer.

3.3 VIDEO CAMERAS AND ACCESSORIES

- 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. Install power supplies and other auxiliary components at control stations unless otherwise indicated.
- D. 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.
- E. Identify system components, wiring, cabling, and terminals according to Section 270553 "Identification for Communications Systems."

3.4 FIELD QUALITY CONTROL

- A. Tests and Inspections:
 - 1. Provide a screen shot of each video camera taken during normal business hours and after dark. Place each screenshot on a PDF. Label each screen shot with the camera designator (name/number). Submit the document to the Owner for review and approval of the camera coverage area (aiming and lens setting).
 - 2. Test the following functions or parameters of the VSS cameras:
 - a) Camera is correct type.
 - b) Mounting is correct type.
 - c) Camera coverage is as indicated on the drawings and approved by the Owner.
 - d) Camera is auto-iris/auto-focus or if manual camera is properly focused.
 - e) Lens and dome are clean.
 - f) Image quality is good.
 - g) After dark IR illuminators switch on and provide sufficient lighting levels.
 - h) Camera name, camera location, timestamp, record indicator, motion activity are displayed overlaid on the video.
- B. Test Reports:
 - 1. Camera functional test reports.

3.5 INSTRUCTION OF OPERATING PERSONNEL

- A. Factory-trained technicians shall give operating and maintenance instructions on the video surveillance systems and equipment. The duration of each session for each system type shall be a minimum of 8 hours.
- B. Additionally, provide instruction of operating personnel as required in Section 280500, Common Work Results for Electronic Security.

END OF SECTION 282000