**PART 1 GENERAL**

**1.1 SUMMARY**

 A. Provide a complete camera positioning system, including engineering, components, installation, and commissioning.

**1.2 RELATED SECTIONS**

A. Section 260500 – Common Work Results for Electrical, for interface and coordination with building electrical systems and distribution.

 B. Section 280513 – Conductors and Cables for Electronic Safety and Security, for cabling between system servers, panels, and remote devices.

 C. Section 280528 – Pathways for Electronic Safety and Security, for conduit and raceway requirements.

 D. Section 281300 – Security Management System, for interface and coordination with electronic access control systems.

 E. Section 282323 – Video Surveillance System Infrastructure

**1.3 REFERENCES**

A. Reference Standards: Provide a system, which meet or exceed the requirements of the following publications and organizations as applicable to the Work of this section:

1. Electronic Industry Association (EIA)

2. Federal Communications Commission (FCC)

3. National Television Systems Committee (NTSC)

4. Underwriters Laboratories Inc. (UL)

5. Institute for Electrical and Electronics Engineers (IEEE)

6. Open Network Video Interface Forum (ONVIF)

**1.4 SYSTEM DESCRIPTION**

A. The remote camera positioning system shall have full HD 1080p60 image resolution with integral 30x optical zoom lens. The positioning device shall include true day-night with variable speed pan and tilt technology with a minimum sensitivity of 0.00008 fc @30 IRE. The remote camera-positioning device shall provide four (4) independent output video streams configurable for H.264, H.265 and MJPEG and analog video output.

**1.5 SUBMITTALS**

1. Manufacturer’s Product Data: Submit manufacturer’s data sheets indicating systems and components proposed for use, including instruction manuals.
2. Shop Drawings: Submit complete shop drawings including connection diagrams for interfacing equipment, list of connected equipment, and locations for major equipment components.
3. Record Drawings: During construction, maintain record drawings indicating location of equipment and wiring. Submit an electronic version of record drawings not later than Substantial Completion of the project.
4. Operation and Maintenance Data: Submit manufacturer’s operation and maintenance data, customized to the system installed. Include system and operator manuals.
5. Field Tests: Submit results of field-testing of every device including date, testing personnel, retesting date if applicable, and confirmation that every device passed field-testing.
6. Maintenance Service Agreement: Submit a sample copy of the manufacturer’s maintenance service agreement, including cost and services for a one-year period for Owner’s review. Maintenance shall include, but not be limited to; labor and materials to repair the system provide test and adjustments, and regular inspections.

**1.6 QUALITY ASSURANCE**

A. Manufacturer: Minimum ten years' experience in manufacturing and maintaining networked camera positioning system IP video recording systems. Manufacturer shall provide technical assistance and support.

**1.7 DELIVERY, STORAGE, AND HANDLING**

A. Deliver materials in manufacturer’s labeled packages. Store and handle in accordance with manufacturer’s requirements, in a facility with environmental conditions within recommended limits.

**1.8 WARRANTY**

A. Manufacturer’s Warranty: The warranty period shall be thirty six (36) months from the delivery date of the system under normal use and service.

**PART 2 PRODUCTS**

**2.1 GENERAL**

A. All equipment and materials incorporated shall be standard components that are regularly manufactured and used in the manufacturer's system.

B. All systems and components shall have been thoroughly tested and in actual use.

C. The specified product shall be manufactured by a firm whose quality system is in compliance with the I.S. EN ISO 9001:2015, QUALITY SYSTEM.

**2.2 SYSTEM CAPABILITIES**

A. The Camera specified herein shall provide an integrated network Camera System with Command Core+TM software technology providing 1080p60 video with 30x auto focus zoom optics and 12x digital zoom capability.

B. The Camera System shall incorporate H.264, H.265 and MJPEG compression and encoding technology for providing low bandwidth, low latency and high quality video images transported over standard Ethernet infrastructures.

C. The Camera System encoding system shall support dynamic video profile creation, allowing user flexibility in defining the quantity and properties of each video profile.

D. The Camera System shall provide hybrid capability delivering both Ethernet and analog composite video and RS422 serial connections for external system connections and control.

E. The Camera positioning drive system shall provide wide dynamic range speed capability of 0.05 to 90 degrees per second, with a minimum of 0.05 degree repeatability, 360 degree continuous pan rotation, and +87 to –90 degree tilt range.

F. The Camera System shall have sufficient holding torque to maintain operation in up to 75mph wind with TS-2 vibration conditions at worst-case orientation into the wind, for each pan and tilt function.

G. The Camera System shall include a web server allowing password protected administration/configuration capabilities along with full camera and positioning system control and viewing functions.

H. The Camera System shall be in full compliance with California Senate Bill No. 327

I. The Camera System shall support user programmed automated actions based on input triggers.

J. The input triggers shall include at minimum external sensors, embedded periodic timer, date/time calendar, maintenance and preset reached functions at a minimum.

K. The output actions shall include at a minimum preset activation, tour activation, OSD message display, FTP snapshot images and email notifications.

L. The manufacturer of the HD Camera Positioning System shall provide at no charge, a camera management tool for providing mass updates and quick and efficient configuration, monitoring and user maintenance of the specified camera.

M. The Camera System manufacturer shall provide a software development kit (SDK) for allowing 3rd party developers all necessary tools available on the users website for integrating the Camera System into the users control system environment.

**2.3 PERFORMANCE SPECIFICATIONS**

 **A. CAMERA**

 1. Sensor: 1/2.8” Exmor R CMOS

 2. Scanning: Progressive

 3. Resolution: 1,920 x 1,080 (1080p) 4.

 4. Capture Rate: 60 fps

 5. Camera Format: Day/Night (IR Cut Filter)

 6. S/N Ratio: >50 db

 **B. SENSITIVITY**

 1. Standard (f1.6, 1/30, 50 IRE)

 a. Color: 0.01 lux (0.001 fc)

 b. B/W: 0.0015 lux (0.00015 fc)

 2. Digital Slow Shutter (f1.6, 1/3, 30 IRE)

 a. Color: 0.0013 lux (0.00013 fc)

 b. B/W: 0.0008 lux (0.00008 fc)

` **C. OPTICS**

 1. Zoom Lens: 30x, 4.3 to 129mm

 2. Aperture: f1.6 -> f4.7

 3. HAFOV: 63.7° to 2.3° @ 1920x1080

 4. Focus Modes: Auto/Manual [Near/Far], Normal, Interval, Zoom Trigger

 5. Focus Sensitivity: Normal/Low

 6. Iris Auto/Manual: [Open/Close]

 7. Lens Speed: Three [Slow, Medium, Fast]

 8. Digital Zoom: 12x, Off/On [Depth]

 **D. IMAGE PROCESSING**

1. Day/Night Mode: Auto, Color, B/W

2. Exposure Mode: Auto/Manual

3. Back Light Comp: Off/On

4. Shutter Auto/Manual: [1/1 -> 1/10,000 - 22 step]

5. Digital Slow Shutter: Off/On [1/30->1/1] with Limit Setting

6. Defog Mode: Off/On/Auto [Defog Strength]

7. Image Stabilization: Off/On

 8. Dynamic Range: 130db, On/Off [Normal, Enhanced]

 9. White Balance: Auto, Indoor, Outdoor, ATW, Sodium Vapor 10. AGC: 1 to 48db, Adjustable

 11. Noise Reduction: Off/2D [NR Level]/3D [NR Level]

E. **PRIVACY MASKS**

 1. Capacity: Up to 24 rectangular masks, displayed on 8 places per screen simultaneously.

 2. Mask Color: User Selectable

 3. Mask Interlock: Mask positions and size are scaled and interlocked with PTZ movements

**F. H.264, H.265/MJPEG ENCODING ENGINE**

* 1. The video encoding and profile management system shall utilize a dynamic architecture based on its encoding power for determining the video streams available. Use of this technology shall allow the following possible video stream configurations:

 a. Video Streams: 4 independently configurable

 b. Video Codec: H.264 [ M, H]/H.265 [M], MJPEG

 2. Video encoder channels shall provide the following configurable properties:

 a. Video Resolution: 1080p, 720p, D1 (NTSC and PAL), VGA, SIF, QVGA

 b. Video Frame Rate: Up to 60 fps, 30 fps default

 c. Video Data Rate: 64Kbs to 8Mbs

 d. Video Rate Control: CBR, VBR

 e. Video GOV: 1 to 600, 30 default

 f. Video Latency: Maximum of four frames (0.133 sec.)

 g. Video Transmission: 99.999% error free

3. Video Streaming Protocols; the camera system shall support the following streaming protocols:

a. RTSP/RTP; The RTSP communication shall occur over a TCP socket. RTP video packets shall be sent over UDP. This mode shall be available at all times for H264, H265 and MJPEG encoded streams.

b. RTSP Interleaved; RTSP commands and the RTP video packets shall be transmitted over a single TCP connection. This mode shall be available at all times for H264, H265 and MJPEG encoded streams.

c. HTTP tunneling; this mode shall use two separate TCP connections for sending and the other for received data from the client over port 80. This mode shall be available at all times for H264, H265 and MJPEG encoded streams.

d. RTP multicast; this mode shall send RTP video packets to the user assigned multicast destination. This mode shall be required to be enabled or disabled. This mode shall be available for both H264, H265 and MJPEG encoded streams.

4. Network Protocol Layers: TCP, UDP, IPv4, IGMP, ICMP, DNS, DHCP, RTP, RTSP, NTP, HTTP, HTTPS, ARP, 802.1x, ONVIF Profile S and T as a minimum.

**G. POSITIONING DRIVE**

1. Pan Range: 360° continuous rotation

2. Tilt Range: 360°

3. Preset Speed: Peak speed of 120°/sec

4. 180° movement: < 2 seconds

5. Manual Speed: 0.05° up to 90°/second

6. Tracking Speed 0.05° up to 90°/second

8. Speed Resolution: Up to 100 variable speeds

9. Repeatability: +/- 0.05°

10 Resolution: +/- 0.05°

11. Presets: Up to 256, Includes pan, tilt, zoom, focus, preset ID, I/O output state

12. Tours Up to 256, Includes presets with dwell, speed, direction and recurrence properties

13. Auto Park Returns to a preset or tour after timer expires, Timer Value [Off, 1 Minute to 999 Hours]

14. Features Auto focus/iris on PTZ, Proportional PTZ, Video freeze on preset, High wind/vibration mode, Set/Clear north calibration, Inverted mounting mode

 15. Holding Torque; The Positioner shall have sufficient holding torque to maintain operation under the following conditions:

* 1. Capable of holding mechanical position and maintaining operation in up to 75mph wind and TS-2 vibration conditions at worst-case orientation into the wind, for each pan and tilt function
	2. Capable of moving to a position and maintaining operation in up to 75mph wind, at worst-case orientation into the wind, for each pan and tilt

**H. AUTOMATED ACTION ENGINE**

1. The camera system shall include the capability to process a variety of input triggers to produce a variety of automated output responses.

2. The configuration of the input trigger to output action shall be user programmable through use of a configuration wizard. The wizard shall guide the user through a set of steps to create the automated camera system responses as required.

3. The camera system input and outputs available through the wizard shall include:

a. Input Triggers: Digital input, FTP error, Valid or invalid login, Tour stopped, Timer, Scheduler, Video Analytic Event, Preset reached, PTZ moved, Maintenance, User command

b. Output Actions: Digital output, Activate wiper, FTP image, Send Email, Send Text, Start Preset or Tour, Display OSD message, Timer/ Scheduler On/Off mode control, Delay, Reset system

4. The camera system shall be capable of processing multiple input triggers in one of three queuing modes.

a. Priority Mode – Each input trigger is assigned a priority level. The highest priority level is processed over lower priorities.

b. FIFO Mode: Each input is processed in the order received

c. LIFO Mode: Each input processed when received, overriding previous inputs.

5. The camera system shall provide multi-step configuration wizard for the Camera Systems Action Engine settings.

**I. VIDEO ANALYTICS**

1. The video analytics engine (VAE) shall be an embedded LINUX application hosted on the camera system. The video analytics shall collect traffic flow statistics from each detection zone including vehicle counts, vehicle speeds and vehicle size when enabled.

2. The statistical data is collected over user defined time periods of 5 minutes, 1 hour and 24 hours. The results can be displayed using the camera systems we interface or can be retrieved from the camera over a network connection.

3. The video analytics shall operate from user defined detection zones (region of interest area(s) or line(s)) within the cameras field of view for analytic processing. Up to a maximum of 32 individual detection zones can be programmed dependent on detection filters used.

4. Video analytic detection of events shall be consumable by the camera systems automated action engine. The automated action engine shall allow users to define the camera systems response output actions.

 a. Vehicle Detection: The VAE shall detect a vehicle entering a user defined detection zone with 95% accuracy. When a vehicle is present in the detection zone, the zone shall me marked as occupied.

 b. Vehicle Count: The VAE shall maintain a count of the number of vehicles that have entered a detection zone.

 c. Vehicle Speed Classification: The VAE shall detect the average speed of a vehicle while travelling through the detection zone and place the vehicle into one of speed categories defined as:

|  |
| --- |
| Vehicle Speed Categories |
| 1 – 9 mph |
| 10 – 19 mph |
| 20 – 29 mph |
| 30 – 39 mph |
| 40 – 49 mph |
| 50 – 59 mph |
| 60 – 69 mph |
| 70 – 79 mph |
| 80 – 89 mph |
| 90 – 99 mph |
| 100 or faster mph |

5. Vehicle Size Classification: The VAE shall classify each vehicle entering a detection zone into one of the length categories defined as:

|  |
| --- |
| Vehicle Length Categories |
| 1 – 9 ft |
| 10 – 15 ft |
| 16 – 19 ft |
| 20 – 39 ft |
| 40ft or longer |

6. Incident Detection: The VAE shall classify a traffic flow pattern through a user configured detection zone as an incident if the average speed of the vehicles travelling through that zone falls below a user defined threshold for a user defined period of time or longer.

7. Traffic Flow Statistics: The VAE shall collect statistics for each user defined detection zone. The statistical data shall include traffic flow attributes as:

|  |
| --- |
| Traffic Flow Statistic Attributes |
| Total Vehicle Count |
| Vehicle count per speed  |
| Vehicle count per size  |

8. Stopped/Parked Vehicle Detection: The VAE shall detect non-moving vehicles in a detection zone after user defined time period has expired.

9. Wrong Way Direction: The VAE shall detect vehicles moving through a user configured detection zone if moving in the opposite direction of normal traffic flow.

10. The VAE statistical data shall be available for immediate viewing using the Camera Systems web server or can be retrieved from the camera using simple HTTP call. The Camera System web server provides a web page for displaying the traffic data collected. The collected data shall also be available as an XML file(s) which can be downloaded with a date/time range from current out to six months archived. The VAE traffic flow statistical data structure shall include the following fields:

a. ID# - The detection zone the statistics were collected from

b. Time Period - The amount of time the data was collected [5 min, 1 hour or 24 hour]

c. Vehicle Count - The number of cars counted over the time period

d. Speed - A histogram of the counted cars speeds during the time

 period. The histogram uses speed increments of 10 mph up to >= 100mph

e. Length - A histogram of the counted cars lengths during

 the time period. The histogram uses length increments of 10 ft. up to >= 40ft

11. Pedestrian Detection: The VAE shall generate SNMP Trap alerts, Onvif events upon detecting a pedestrian inside a user defined detection zone. The pedestrian detection events shall be consumable by the camera systems automated action engine.

**J. COMMUNICATION PROTOCOLS AND FORMATS**

1. The camera system shall include integrated video camera system communication drivers for flexibility and system interoperability. The camera system shall support both serial RS422 and Ethernet communication channels at a minimum, allowing field selection of the following protocol drivers as required:

a. Ethernet Channel (IP)

1. NTCIP 1205

2. ONVIF Profile S and T

3. CohuHD

4. CohuT

5. FAST

6. Pelco D

b. Serial RS422 Channel

1. CohuHD

2. Pelco D and P

3. NTCIP 1205

4. Ultrak

5. A/D

6. Javelin

7. FAST

2. Analog Video Interface

 a. Video Format: NTSC or PAL

 b. Serial PTZ: RS422, full/half duplex, 1,200 to 115k baud adjustment, data, stop and parity bit configuration.

3. Digital I/O Interface

 a. Digital Circuits: Up to four digital I/O circuits, user defined as either input or output

**K. ON-SCREEN DISPLAY (OSD)**

1. The HD Camera Positioning System shall provide OSD capabilities on both digital video and analog video outputs as defined below.

 a. OSD Capacity: Up to 7 OSD Elements can be selected for display on video

 b. OSD Elements: Text, Preset, Position, Compass, Date/Time, Sector, Maintenance, Action Event

 c. OSD Characters: Up to 40 characters per text element

 d. OSD Size: Adjustable from 12, 18, 24, 30, 36, 42, 48, 54, 60, 72, 84 or 96 pt. size

 e. OSD Color: White, Black, Green, Red, Blue

 f. OSD Transparency: Adjustable from 0-100%

 g. OSD Background: Transparent, Black

 h. OSD Location: Upper Right/Left, Lower Right/Left, Center, Custom

 i. Banner Display: On/Off, Top/Bottom, 4 OSD elements

 j. Logo Display: BMP, JPEG Format, [x,y] position, Transparency

2. The camera system shall provide multi-step configuration wizard for OSD settings.

3. The camera system shall include a suite of factory-installed fonts and shall be capable of allowing users to upload their own selected TrueType fonts.

`**L. MAINTENANCE FUNCTIONS**

The camera system shall support maintenance features as defined below.

1. The camera system shall support querying of camera parameters via the Ethernet connection. The camera parameters shall consist of the following items

a. Camera Model Number

b. Manufacture

c. MAC Address

d. Network Negotiation Mode

e. Network Speed

f. Software revision

2. Upgrade Software over Ethernet

3. Reboot Camera, Factory Default, Calibrate Positioner

4. Backup and restore user defined camera configurations

5. Support functions: Camera uptime, network connections/activity shall be displayed on web interface

6. System messages: Information, Warning and Error messages shall be displayable and downloadable over network connection for maintenance support.

**M. IP/NETWORK MANAGEMENT**

1. Network Format: 802.3u 100Base-T, MDI-X auto-sensing, full duplex

2. Network Protocols: TCP, UDP, IPv4, ICMP, DNS, IGMPv2/v3, DHCP, RTP, RTSP, RTCP, NTP, HTTP, SOAP, HTTPS, ARP, FTP, SMTP, SNMP v1|2|3, TLS, SSL, AES, SMTP, QoS, NTCIP, Telnet, 802.1X ONVIF Profile S and T,

3. Media Players: VLC, Quick Time or any media player compliant with RFC 2326, 3984, 3550, 2435, 7798, ISO/IEC 13818-1

4. ONVIF: Profile S and T

5. Security: 4 Levels: Admin, Operator, User, Anonymous [User Name + Password], Digest Authentication

6. Updates: File upload over network using camera web server interface

7. Configurations: Stored in Non-Volitiale Memory

8. Browsers: Edge, Firefox, Chrome

 **N. ELECTRICAL**

 **1.** The HD Camera Positioning System shall fully comply with Nema TS-2 standards and include independent laboratory test results confirming compliance with the following electrical operating conditions;

 a. Input Voltage: PoE++, 24Vac/dc or 120Vac, model dependent

 b. Power: Typical 30w, up to 60w with heaters ON

 c. Voltage Range: PoE++ and 120Vac – NEMA standard TS 2-2003 section 2.2.7 tests C thru H

 24Vac, 18Vac to 28Vac at camera connector

 24Vdc, 20Vdc to 28Vdc at camera connector

 d. Transient/Surge : Certified to CISPR 24 levels

 e. Emissions: Certified to CISPR 22 levels

 f. Pigtail Cable: Approx. 24”

**O. MECHANICAL SPECIFICATIONS**

1. Weight: 12.5 lbs (5.7 kg)

2. Dimensions; 11.4” (289.6mm) x 11.7” (297.2mm)

3. Construction: Powder Coated aluminum

4. Sunshield: Included as standard

5. Color: Light Gray Cardinal Coating T241-GR142

6. Camera window; Nylon, Optically Correct

7. IK10: Camera System except camera window is IK10

8. Camera Mount; 1.5” NPT

**P. ENVIRONMENTAL REQUIREMENTS**

1. The HD Camera Positioning System shall fully comply with and include independent laboratory test results confirming compliance with the following environmental operating conditions:

 a. Protection Rating IP68, Purged with Dry Nitrogen. Shall withstand water immersion at 1m for 24 hours with no water ingress. Lifetime warranty on moisture ingress.

 b. Operating Temperature: -40°F to 165°F (-40°C to 75°C) Per NEMA TS2, para 2.2.7.

 c. Internal Heaters: Two DC resistive heater assemblies, software controlled, to maintain internal heat for operation down specified operating temperatures above.

 d. Relative Humidity: Operation from 0-100%

 e. Vibration: Per NEMA TS2 para. 2.2.8. 5-30Hz sweep @ 0.5g applied in each of 3 mutually perpendicular planes.

 f. Shock: Per NEMA TS2 para. 2.2.9. 10g applied in each of 3 mutually perpendicular planes

 g. Corrosion: MIL-STD-810G, Method 509.5, Paragraph 4.5.2, ANSI NCSL Z540-1, ISO 17025:2005

 h. Wind Survivability: Up to 150 mph, 120 mph for 45 minutes

 150 mph for 15 minutes

 i. MTBF: 251,000 hours, based on HALT Steady State Field MTBF calculations

**2.4 CERTIFICATIONS**

 1. CE, FCC Part 15B, RoHS, AS/NZS CISPR 22:2009+A1:2010, CAN/CSA- CISPR 22-10, EN 55022:2010+AC: 2011, EN 55024:2010, EN 61000-3- 2:2006, +A1:2009+A2:2009, EN 61000-3-3:2013, EN 61000-4-2: 2009, EN 61000-4-3: 2006 +A1:2008 +A2:2010, EN 61000-4-4: 2004, EN 61000-4- 5: 2006, EN 61000-4-6: 2009, EN 61000-4-8: 2010, EN 61000-4-11: 2004

 **2.5 WARRANTY INFORMATION**

A. Manufacturer’s Warranty: The warranty period shall be thirty-six (36) months from the delivery date of the system under normal use and service.

**PART 3 - EXECUTION**

**3.1 EXAMINATION**

A. Examine areas to receive devices and notify adverse conditions affecting installation or subsequent operation.

B. Do not begin installation until unacceptable conditions are corrected.

**3.2 PREPARATION**

* + - * 1. Protect devices from damage during construction.

**3.3 INSTALLATION**

A. Install devices in accordance with manufacturer’s instruction at locations indicated on the floor drawings plans.

B. Perform installation with qualified service personnel.

C. Install devices in accordance with the National Electrical Code or applicable local codes.

D. Ensure selected location is secure and offers protection from accidental damage.

E. Location must provide reasonable temperature and humidity conditions, free from sources of electrical and electromagnetic interference.

**3.4 FIELD QUALITY CONTROL**

A. Test snugness of mounting screws of all installed equipment.

B. Test proper operation of all video system devices.

C. Determine and report all problems to the manufacturer’s customer service department.

**3.5 ADJUSTING**

A. Make proper adjustment to video system devices for correct operation in accordance with manufacturer’s instructions.

B. Make any adjustment of camera settings to comply with specific customer’s need.

**3.6 DEMONSTRATION**

* + 1. Demonstrate at final inspection that video management system and devices functions properly.

END OF SECTION