

## SECTION 17850

### CLOSED CIRCUIT TELEVISION CAMERA (CCTV) SYSTEM

#### PART 1 - GENERAL

##### 1.01 DESCRIPTION

- A. Section includes requirements for the Closed Circuit Television Camera (CCTV) System and associated Local Area Network (LAN) as a subsystem of Caltrain station communications. These requirements are for standard Caltrain station video surveillance applications. For other applications (i.e. maintenance facilities, tunnels, bridges, infrared/wireless CCTV, etc.) refer to the corresponding project additional specific requirements.
- B. Coordinate and provide interfaces between the station Communications Equipment Room (CER) and the station CCTV subsystem. Note that, in absence of CER, some Caltrain stations may still utilize outdoor Station Communications Cabinets (SCC) also sometimes referred to as Communications Interface Cabinets (CIC). In the future, SCC's/CIC's will be phased out and upgraded to CER's. In these specifications, for simplicity, the terms "SCC" and "CIC" are omitted. The term "CER" is used instead and it covers all types of station central Communications equipment implementation.
- C. The design (from concept to final stage), installation and acceptance shall follow CPTED (Crime Prevention Through Environmental Design) guidelines. The design, installation, testing and acceptance shall be approved and witnessed by CPTED certified personnel and Caltrain.

##### 1.02 REFERENCED STANDARDS

- A. Electronic Industries Association (EIA):
  - 1. Standards 170, 232, 250C and 485
- B. Federal Communications Commission (FCC):
  - 1. Rules Part 15, Sub-part J – Equipment Authorization Procedures
- C. International Standards Organization (ISO):
  - 1. 9001 Quality Management Systems - Requirements
- D. Military Standards (MIL-STD)
  - 1. 454 Standard General Requirements for Electronic Equipment
  - 2. 810E Method 509 Procedure 1 – exterior salt atmospheres
- E. National Fire Protection Association (NFPA):
  - 1. 70 National Electric Code (NEC)

- F. National Electrical Manufacturers Association (NEMA)
- G. Institute of Electrical and Electronics Engineers (IEEE)
- D. Department of Homeland Security (DHS)

### **1.03 SYSTEM DESCRIPTION AND CONFIGURATION**

- A. Closed Circuit Television Cameras (CCTVs) at each passenger station shall be connected into the Station LAN to consolidate data at the Communications Equipment Room (CER) via a 100/1000 Mbps multi-port redundant Ethernet Station LAN switches.
- B. Redundant Ethernet switch ports at the CER are provisioned at least 100 Mbps for a separate CCTV Virtual Local Area Network (VLAN) to segregate the CCTV traffic from all others on the network.
- C. The station CCTV VLAN shall share the station LAN 1000 Mbps Ethernet backbone bandwidth with other station subsystems. The station LAN 1000 Mbps backbone will operate in a physical ring topology via the station single-mode fiber optic cable.
- D. Depending on the cabling distance, each station CCTV location shall be directly connected to its assigned network switch using dedicated either copper (Category 6) or fiber optic cable and raceway.
- E. CCTV cameras requiring Power over Ethernet (PoE) shall utilize Cat 6 cable. The Distribution Cabinet redundant Ethernet Switches shall either incorporate PoE capable Ethernet ports or utilize external PoE power injectors. The external power injectors shall be used only for locations where the Ethernet switches are existing and do not incorporate PoE capable ports functionality.
- F. At field locations where the VMS (visual message sign system) occupy the same pole as the CCTV, separate raceway will be used for each subsystem.
- G. CCTV cameras connections shall be equally distributed between two redundant switches/rings. When available, CCTV cameras with integrated network switching and route protection capabilities shall be provided dual copper or fiber cable connectivity for maximum network redundancy.
- H. All station cameras will use TCP/IP protocol. Digital video recorders, mobile computer, and motion detection software will be housed in the station CER.
- I. Products specified herein will cover digital (IP) cameras. The design preference of choice for new construction is an IP video camera to reduce cabling, electronic components, and power consumption. Whenever cabling distances allow, IP cameras shall operate Power-over-Ethernet (PoE) IEEE 802.3af.
- J. The station CCTV system components shall be compatible with the Caltrain existing CCTV headend in Caltrain headquarters in San Carlos provided by Verint Nextiva. The modifications to the existing Caltrain headend will be performed by Caltrain. The Contractor shall facilitate integration of the new station CCTV equipment into the existing CCTV headend and coordinate with Caltrain on the

design, implementation and testing details of the new equipment affecting the existing system.

#### **1.04 DETAILED WORK SCOPE**

- A. This work includes installing field CCTV assemblies consisting of camera, zoom lens, pan/tilt drive, power supply and standard or dome enclosure. Work scope includes furnishing and installation of CCTV assembly, cabling, network electronics, and CCTV interface panel and the station Digital Video Recorder (DVR). The work also includes furnishing and installing communication interface for fiber optic and data cable. Camera assembly shall include all necessary for proper operations pole or surface mounting and attachment hardware and electrical cabling and connections.
  
- B. The CCTV camera system shall include, but not be limited to, the following components and features:
  - 1. CCTV camera with auto focus zoom lens at a mounting height above the platform or station surface as detailed in the Contract drawings.
  - 2. The CCTV Camera assembly and/or mounting hardware shall allow for the specified pan and tilt.
  - 3. Standard or dome, watertight environmental housing, and, if required by design, capable of being pressurized.
  - 4. Mounting hardware with no exposed camera control or power wiring.
  - 5. CCTV camera pole with or without the use of a lowering device, with a pole height above the platform surface as detailed in the site specific drawings (stand-alone CCTV camera poles are typically used only if the existing station structures cannot be utilized).
  - 6. Site data/power cabling for IP cameras.
  - 7. Camera control electronics and equipment (i.e., hardware and software).
  - 8. CCTV assembly with azimuth and labeling capabilities.
  - 9. Power, and data/video cables for external power supplies (if required), images, and camera controls.
  - 10. Transient voltage suppression and surge/lightning protection.
  - 11. Network communication cables.
  - 12. Power over Ethernet injectors as required by the camera locations and design.
  - 13. Indication of the blank out or privacy zone positions using text messages on the video display.

14. Image and data transfer using the specified network communication media.
15. Video processing, storage and display equipment.
16. Any and all ancillary equipment required for a fully operational, shared surveillance system.
17. NTCIP compatible driver.
18. 4-wire 422 interface, if applicable.
19. Text labeling on video display.

#### **1.05 SUBMITTALS**

- A. Refer to Section 17000, Basic Communications Technical Requirements, for related and additional submittal requirements.
- B. Submit detailed catalog data for all equipment and materials, including accessories.
- C. If proposed CCTV mounting is not an off-the-shelf item or was not originally designed to be used for the proposed mounting arrangement, submit structural design, including drawings and calculations, signed and sealed by a Structural Engineer licensed in the state of California.
- D. With each Design Review level, submit the updated CCTV coverage map. The CCTV coverage map shall identify for each camera: camera type and model; mounting elevation; tilt; direction of coverage, radius of coverage; horizontal and, where necessary, vertical angles of view. Coordinate with Caltrain the desired level of detail (pixel per foot) requirements for each camera. Typical high priority targets require camera resolution of more than 40 pixels per foot (forensic level of details); the remaining areas typically require at least 20 pixels per foot (general level of details).
- E. With each Design Review level, submit the proposed WAN/LAN/VLAN IP addressing scheme and security scheme for all new CCTV elements to match the addressing scheme and security scheme of the existing Caltrain CCTV headend.
- F. Submit installation drawings no later than 14 days prior to installation of the CCTV system. Include description of modifications and the cutover sequence for incorporating of the new CCTV equipment into the existing Caltrain CCTV system and fall-back procedures (in case something goes wrong). Proceed with the installation only after the Engineer approval of installation submittal.
- G. Testing: Conduct local station CCTV testing to verify each camera's settings and coverage details as per the approved Design Submittals. After the successful local testing and the cutover to the existing CCTV headend, assist Caltrain personnel with integrated headend/field CCTV system testing. All tests shall be done as per the approved test procedures and witnessed/signed-off by the Contractor and Caltrain. Prior to signing off a tested equipment/function; if found, each issue in the Contractor's scope of work shall be corrected by the

Contractor and retested prior to final acceptance by Caltrain. Submit, within 15 days after conclusion of system testing, a report of final Test Procedures and the Results obtained from these tests.

- H. As-Built Documentation: Submit complete As-Built documentation and drawings, as specified in Section 17000, Basic Communications Technical Requirements, for equipment. Also, the As-Built documentation shall contain the asbuilt CCTV System coverage areas, the station CCTV equipment final LAN/WAN and Software configuration settings.
- I. Operation and Maintenance Data: Provide documentation containing complete details of the delivered equipment including operating and maintenance procedures and manuals.

## **PART 2 - PRODUCTS**

### **2.01 GENERAL**

- A. Typical Station CCTV System Components:
  - 1. Integrated camera assembly: Depending on each camera type, it may include following elements: camera, lens, housing, pan-tilt drive unit, infrared illuminator, fan/heater/blower, fiber transceiver, power supply, mounting brackets and other mounting hardware.

Some CCTV Camera manufacturers provide for complete "all-in-one" camera assemblies, where all elements are already included and match (do not require separate design and manual labor for the assembly) and include all necessary equipment for mounting and termination. These types of CCTV assemblies provide significant saving for the project by simplifying the design and reducing the amount of labor.

CCTV camera assemblies are typically made specifically for either outdoors or indoor applications. Some vendors, however, produce universal types of camera assemblies, which may be used for either environment.
  - 2. An integrated camera assembly is connected (via the associated conduits) to the closest point of service, which is typically the closest redundant Ethernet switch located at either the nearby Distribution Cabinet (DC) or Communication Equipment Room (CER). Typically PoE is used for powering the camera assemblies.

For remote locations, a fiber optic cabling is used, which requires the camera assembly to incorporate a fiber transceiver and for the designers to identify local sources of power. Where installation of the fiber cabling is problematic, a wireless link maybe considered for the remote sites. Implementation of the wireless links; however, is not recommended (due to numerous challenges of the transit environment) and shall be considered as a last option resort.
  - 3. A rack-mounted Station CCTV DVR equipment with all necessary hardware and software configured to communicate with the Caltrain

existing headend. The station DVR equipment shall be mounted into either the dedicated rack within CER; or dedicated standalone rack in telecommunication closet.

4. All other materials necessary for installation of the CCTV and other cabinets and camera assembly (including materials required to interface the CCTV camera assembly to the electrical power) as required.

## 2.02 INTEGRATED IP FIXED CAMERA ASSEMBLY

### A. Product Description:

1. The specified product shall be a high-resolution Day/Night network camera integrated into an all-weather NEMA 4/IP66 rated enclosure designed for both indoor and outdoor applications. The integrated camera is an industrial grade, color, and full-featured, day/night 5.0 megapixel network camera.

The unit consists of 1) a camera and lens module, 2) a wall, ceiling, and parapet arm, and 3) a power/data back box. The camera shall be powered via the Ethernet (Power-Over-Ethernet) using an IEEE 802.3af power source or may be powered directly via 12-24VDC or 24VAC.

The product shall be designed to meet or exceed industrial and surveillance applications requiring a low power, rugged video camera with IP network capability. The camera shall have a built-in web server and FTP server.

### B. General Product Requirements:

1. The specified product shall be a high-resolution, Day/Night 1/2-inch optical format, network camera integrated into an all-weather NEMA 4 / IP66 rated enclosure designed for both indoor and outdoor applications.
2. The operating temperature range shall be -22 deg F to +122 deg F.
3. The integrated camera shall be an industrial grade, color, and full-featured, Day/Night 5.0 megapixel network camera with 1/2-inch optical format.
4. The camera shall be powered via the Ethernet (Power-Over-Ethernet) using an IEEE 802.3af power source or powered directly via 12-24VDC or 24VAC.
5. The power/data back box shall allow entry of cables from the rear of the box that pass through two 1/2-inch Heyco watertight fittings. A 1/2-inch NPT mount shall also be available at the bottom of the box to accommodate cables or conduit.
6. The back box shall be supplied with arm hangers to hold the camera/arm module in place on the back box during wall, ceiling, or parapet mounting installation.

7. The back box shall provide both input and output alarm trigger connections.
8. The camera unit shall have a pivoting arm to allow the product to be wall, ceiling, or parapet mounted without requiring any additional hardware.
9. The camera housing shall be 360 deg adjustable in the pan direction and 180 deg in the tilt direction.
10. The camera shall be vandal and tamper-resistant.
11. The product shall be available with any of the following lenses:
  - a. 4-12 mm, f1.4, 1/2-inch CS format, wide varifocal IR corrected lens
  - b. 12-40 mm f1.4, 1/2-inch CS format, telephoto varifocal IR corrected lens
  - c. 1.8-3 mm, f1.8, 1/2-inch CS format, ultra wide varifocal IR corrected lens
12. To simplify lens setup during installation, an analog output for a display monitor shall be accessible when the lens housing is separated from the camera housing.
13. A mechanical reset button shall be available in the back box to return the camera to the factory default setup.

C. Camera Specifications:

1. The Day/Night high-resolution color camera specified shall incorporate a progressive scan CMOS imager with a 1/2-inch optical format, not less than 5.0 million megapixels and shall have a dichroic infrared mirror.
2. The image resolution shall be minimum 2560(H) x 1920(V) pixels. The camera's aspect ratio (horizontal vs. vertical lines) shall be user configurable and not limited to only 4:3 or 9:6 aspect ratios.
3. The camera shall produce 10 frames per second (fps) at full 2560(H) x 1920(V) resolution. The maximum frame rates are 10fps at 4:3 aspect ratio and 13fps at 16:9 aspect ratio.
4. Minimum light requirement to produce a color image shall be approximately 0.30 lux (0.03 fc) with a f1.2 lens. When in the IR sensitive Night mode, less than 0.05 lux (.005 fc) will produce a black and white image.
5. The camera shall provide automatic white balance, automatic exposure, gain control, electronic shutter, and backlight compensation. It shall use MJPEG (and MPEG-4/H.264, if available) video-compression. The images can be viewed via a standard browser.

6. A night mode feature, shall slow the shutter speed down to enhance the nighttime sensitivity of the camera.
  7. The camera shall have on-camera storage. Provide for a minimum 32GB card for on-camera storage purposes.
  8. Digital image authentication shall be optionally available and licensed to verify that images have not been altered, manipulated, or tampered with, in any way.
  9. The camera shall provide on-screen time/date and text displays. The text display can be programmed to dynamically change when motion alarms are detected.
  10. The camera shall provide built-in motion detection allowing up to eight separate, rectangular motion windows (zones) to be independently configured. Each window may have its interior pixels included or excluded from consideration by the motion detection algorithm. Windows configured to have pixels included in the motion calculations shall allow the threshold of both the sensitivity (pixel values) and size (quantity of pixels) to be set.
  11. The camera shall provide on-screen, digital, pan/tilt/zoom on live or recorded video.
  12. Provide User and Administrator password protection levels.
  13. Up to eight (8) rectangular privacy windows may be configured to mask out specific video from view in the image.
  14. The camera shall capture image sequences by time lapse intervals or trigger events and transfer the jpeg images via FTP and/or e-mail.
  15. Specialized software that enables multiple users to receive alerts via a pop-up window when the camera receives an internal or external trigger shall be available via an optional license upgrade.
- D. Camera Networking Requirements:
1. The camera shall incorporate a built-in web server, built-in FTP server, and a built-in FTP client.
  2. Camera functionality shall be available to users running versions of Java VM and web-browser applications released after January 1, 2004.
  3. The camera shall provide integrated support for IP, TCP, UDP, ICMP, ARP, FTP, SMTP, DHCP, HTTP, RARP, BOOTP, SNMP, Telnet, and TFTP protocols.
  4. The camera shall provide a multiview function where a single browser page shall be capable of displaying streaming images from up to nine cameras simultaneously.

5. No unique or proprietary client software shall be required for viewing or controlling the camera.
6. The camera shall be user configurable and the administrator may functionally or aesthetically modify the camera's web pages.
7. The camera shall provide for up to 64 area-of-interest streams that can be independently created of any size and aspect ratio and with any desired display resolution. Substream frame rate can also be configured, up to the maximum frame rate delivered by the camera.
8. The camera shall offer a web interface for quick creation of up to three substream windows with auto-port configuration of each stream.

E. Camera Recording/Playback Requirements:

1. The manufacturer shall offer optional, licensable embedded recording/playback software that allows images to be recorded to an external FTP server.
2. Images may be stored at a fixed periodic record rate and/or when triggered by motion and/or external input. Playback shall allow all images recorded to be viewed forward or backward in time.
3. The camera shall record all images in a proprietary file format.
4. The camera shall include pre-event and post-event recording, time-date search, JPEG snapshot, and AVI export functionality.

F. Event (Alarm) Handling Capability:

1. The camera shall be capable of recording an event as pre and post event images. The camera shall also be able to transfer the event's JPEG images to an FTP server via File Transfer Protocol (FTP). Events may be triggered using camera motion detection or from an external device input such as a relay.
2. When triggered from an external input or the camera's motion detector, the camera shall be capable of sending JPEG images via e-mail and/or sequences of images to an FTP server.
3. A relay output shall be available upon the activation of the camera's motion detector or external relay input. The relay output may also be manually activated from the live view screen.

G. Back box Connections:

1. RJ-45 Ethernet connector (IEEE 802.3af PoE compliant)
2. Punch Down terminal for CAT5, CAT5e, or CAT6 cable

3. Screw terminal: Direct power for 12-24VDC or 24VAC, Trigger In and Trigger Out
- H. Electrical Specifications:
1. Power Consumption: 6 watts maximum
  2. Power requirement: 12-24VDC or 24VAC or via IEEE 802.3af Power-over-Ethernet on CAT5, CAT5e, or CAT6 cable
- I. Mechanical Specifications:
1. Weight (without lens): 96oz (2839g)
  2. Dimensions: 15.36 L x 5.18 W x 9.58 H inches
  3. Lens: As required by the application
  4. The camera shall feature solid-state components to resist shock and vibration and have no moving parts
- J. Environmental Specifications:
1. Temperature range: -22 deg. F to +122 deg. F
  2. Environmental Enclosure rating: IP66/NEMA 4
- K. Certifications and Approvals:
1. Electromagnetic Compatibility
    - a. Emissions:
      - i. FCC, Class A part 15
      - ii. EN 55022:1998 with A1:2000, A2:2003; Class A
      - iii. CISPR 22: 1997 with A1:2000, A2:2002; Class A
      - iv. AS/NZS CISPR 22:2002; Class A
    - b. Immunity:
      - i. EN 55024:1998 with A1:2001, A2:2003
      - ii. CISPR 24:1997 with A1:2001, A2:2002
  2. Safety:
    - a. EN 60950-1:2001 with A11:2004
    - b. IEC 60950-1:2001

3. Restriction of Hazardous Substance (RoHS): All material and/or components used in the manufacture of the product shall be in compliance with the EU Directive 2002/95/EC RoHS.
- L. IP camera assembly shall be IQinVision model IQeye Sentinel Series, IQeye855v7 or Caltrain approved equal.

### **2.03 INTEGRATED DOME IP CAMERA ASSEMBLY**

- A. Product Description:
  1. The product specified shall be an all-in-one vandal/tamper resistant 5.0 megapixel resolution color dome camera designed for indoor/outdoor applications providing multiple H.264 (MPEG4, Part 10) and simultaneous MJPEG streams that can be individually configured. The dome camera shall provide 10fps at maximum resolution with audio, and shall conform to the ONVIF and PSIA standards.
  2. The camera shall provide for Day/Night functionality with high sensitivity for use in low light indoor/outdoor applications, and is prepackaged with a varifocal IR corrected lens to allow manual zoom and focus adjustment.
  3. The dome camera shall be constructed of cast-aluminum housing with polycarbonate dome bubble and auto tracking inner liner. The dome camera shall be designed to protect against water and dust to IP66 / NEMA 4 standards; require low power the dome camera such as PoE (IEEE 802.3af) compliant, or direct power by 12-24VDC or 24VAC.
- B. General Product Requirements:
  1. The specified product shall be a high-resolution, Day/Night ½-inch optical format, network camera integrated into an all-weather NEMA 4 / IP66 rated enclosure designed for both indoor and outdoor applications.
  2. The operating temperature range shall be -22 deg F to +122 deg F.
  3. The integrated camera shall be an industrial grade, color, and full-featured, Day/Night 5.0 megapixel network camera with ½-inch optical format.
  4. The camera shall be powered via the Ethernet (Power-Over-Ethernet) using an IEEE 802.3af power source or, if necessary, powered directly via 12-24VDC or 24VAC.
  5. The power/data back box shall allow entry of cables from the bottom of the dome that pass through watertight fittings.
  6. Various types of mount shall also be available to accommodate various types of mounting surfaces (i.e. wall, ceiling, or parapet) and/or mounting installations.

7. The assembly shall provide both input and output alarm trigger connections.
8. The IP dome camera shall have a 3-axis gimbal providing 360° pan, 90° tilt and 350° azimuth for easy camera positioning.
9. The camera shall provide for audio input/output: Microphone/Line In and Line Out
10. The camera shall be vandal and tamper-resistant.
11. The product shall be available with any of the following lenses: An integrated 3-13mm megapixel IR corrected varifocal lens with F1.4, and 1 / 2.5" optical format.
12. To simplify lens setup during installation, an analog output for a display monitor shall be accessible when the lens housing is separated from the camera housing. TCP/IP protocol video output via a RJ-45 Ethernet connection and an NTSC (PAL) analog video output via a BNC connection outputs may be used simultaneously.
13. A mechanical reset button shall be available to return the camera to the factory default setup.
14. The IP dome camera shall conform to the ONVIF and to the PSIA standards.

C. Camera Specifications:

1. The Day/Night high-resolution color camera specified shall incorporate a progressive scan CMOS imager with a 1/2-inch optical format, not less than 5.0 million pixels and shall have a dichroic infrared mirror.
2. The image resolution shall be minimum 2560(H) x 1920(V) pixels. The camera's aspect ratio (horizontal vs. vertical lines) shall be user configurable and not limited to only 4:3 or 9:6 aspect ratios. The camera shall produce 10 frames per second (fps) at full 2560(H) x 1920(V) resolution and at either 4:3 aspect or 16:9 aspect ratios.
3. The IP Dome camera shall have three video streams that can be individually configured for H.264 and MJPEG from the webpage and API interface. The IP dome camera shall have three video streams that can be independently configured for different resolutions. The IP dome camera shall have quality control over the MJPEG image stream with four selectable quality values from the webpage interface and with 86 selectable compression values from the API interface.
4. Minimum light requirement to produce a color image shall be approximately 0.30 lux (0.03 fc) with a f1.2 lens. When in the IR sensitive Night mode, less than 0.05 lux (.005 fc) will produce a black and white image. The IP dome camera shall provide an automated IR filter that will automatically switch from color to monochrome enhancing low lighting or in applications where IR illumination is utilized.

5. The camera shall provide automatic white balance, automatic exposure, gain control, electronic shutter, and backlight compensation. Dome camera dynamic range shall be 71dB. It shall use H.264 and MJPEG video-compression. The images can be viewed via a standard browser.
  6. A night mode feature shall slow the shutter speed down to enhance the nighttime sensitivity of the camera.
  7. The camera shall have on-camera storage using Micro SD Class 6+. The Contractor shall provide a minimum 32GB card for on-camera storage purposes.
  8. Digital image authentication shall be optionally available and licensed to verify that images have not been altered, manipulated, or tampered with, in any way.
  9. The camera shall provide on-screen time/date and text displays. The text display can be programmed to dynamically change when motion alarms are detected.
  10. The camera shall provide built-in motion detection allowing up to eight separate, rectangular motion windows (zones) to be independently configured. Each window may have its interior pixels included or excluded from consideration by the motion detection algorithm. Windows configured to have pixels included in the motion calculations shall allow the threshold of both the sensitivity (pixel values) and size (quantity of pixels) to be set.
  11. The camera shall provide on-screen, digital, pan/tilt/zoom on live or recorded video.
  12. Provide User and Administrator password protection levels.
  13. Up to eight (8) rectangular privacy windows may be configured to mask out specific video from view in the image. Dome camera shall provide image cropping.
  14. The camera shall capture image sequences by time lapse intervals or trigger events and transfer the jpeg images via FTP and/or e-mail.
  15. Specialized software that enables multiple users to receive alerts via a pop-up window when the camera receives an internal or external trigger shall be available via an optional license upgrade.
  16. Dome camera will allow for an optional license upgrade that allows the creation of day and night configuration files for image optimization
- D. Camera Networking Requirements:
1. The camera shall incorporate a built-in web server, built-in FTP server, and a built-in FTP client.

2. Camera functionality shall be available to users running versions of Java VM and web-browser applications released after January 1, 2004.
  3. The camera shall provide integrated support for TCP/IP, HTTP, HTTPS, DHCP, UDP, RTP, RTSP, DNS, ARP, ICMP, NTP, UPnP, ZeroConf, APIPA, UDP multicast, SNMP, FTP, SMTP, Telnet, CIFS protocols.
  4. The camera shall provide a multiview function where a single browser page shall be capable of displaying streaming images from up to nine cameras simultaneously.
  5. No unique or proprietary client software shall be required for viewing or controlling the camera.
  6. The camera shall be user configurable and the administrator may functionally or aesthetically modify the camera's web pages.
  7. The camera shall provide for up to 64 area-of-interest streams that can be independently created of any size and aspect ratio and with any desired display resolution. Substream frame rate can also be configured, up to the maximum frame rate delivered by the camera.
  8. The camera shall offer a web interface for quick creation of up to eight substream windows with auto-port configuration of each stream.
- E. Camera Recording/Playback Requirements:
1. The IP dome camera shall support on camera storage of time lapse and event recording using micro SD Class 6+ media.
  2. Images may be stored at a fixed periodic record rate and/or when triggered by motion and/or external input. Playback shall allow all images recorded to be viewed forward or backward in time.
  3. The camera shall record all images in a proprietary file format.
  4. The camera shall include pre-event and post-event recording, time-date search, JPEG snapshot, and AVI export functionality.
  5. The dome camera shall allow for an optional license upgrade that creates a unique encrypted digital signature that identifies the camera that produced the image and detects if the image has been altered.
- F. Event (Alarm) Handling Capability:
1. The IP dome camera shall have an event handler allowing the camera to send an image or video clip to on-camera storage, FTP site, email address, and or network attached storage when receiving an internally or externally generated event.
  2. When triggered from an external input or the camera's motion detector, the camera shall be capable of sending JPEG images via e-mail and/or sequences of images to an FTP server.

3. A relay output shall be available upon the activation of the camera's motion detector or external relay input. The relay output may also be manually activated from the live view screen.

G. Connections:

1. RJ-45 Ethernet connector (IEEE 802.3af PoE compliant)
2. Punch Down terminal for CAT5, CAT5e, or CAT6 cable
3. Screw terminal: Direct power for 12-24VDC or 24VAC, Trigger In and Trigger Out
4. Analog Service Port: for NTSC and PAL video outputs with 1Vp-p levels
5. Micro SD Card Media Slot
6. Alarm I/O terminals

H. Electrical Specifications:

1. Power Consumption: 5.3 watts maximum
2. Power requirement: 12-24VDC or 24VAC or via IEEE 802.3af Power-over-Ethernet on CAT5, CAT5e, or CAT6 cable

I. Mechanical Specifications:

1. Weight (without lens): 96oz (2839g)
2. Dimensions: 15.36 L x 5.18 W x 9.58 H inches
3. Lens: As required by the application
4. The camera shall feature solid-state components to resist shock and vibration and have no moving parts

J. Environmental Specifications:

1. Temperature range: -4 deg. F to +122 deg. F
2. Environmental Enclosure rating: IP66/NEMA 4

K. Certifications and Approvals:

1. Electromagnetic Compatibility:
  - a. Emissions:
    - i. FCC, class A part 15
    - ii. EN 55022:1998 with A1:2000, A2:2003; Class A

- iii. CISPR 22: 1997 with A1:2000, A2:2002; Class A
      - iv. AS/NZS CISPR 22:2002; Class A
    - b. Immunity:
      - i. EN 55024:1998 with A1:2001, A2:2003
      - ii. CISPR 24:1997 with A1:2001, A2:2002
  - 2. Safety:
    - a. EN 60950-1:2001 with A11:2004
    - b. IEC 60950-1:2001
  - 3. Restriction of Hazardous Substance (RoHS): All material and/or components used in the manufacture of the product shall be in compliance with the EU Directive 2002/95/EC RoHS.
- L. IP camera assembly shall be IQinVision model IQeye Alliance Pro Series, IQA35NE-B6 or Caltrain approved equal.

#### **2.04 INTEGRATED PTZ IP CAMERA ASSEMBLY**

##### **A. Product Description**

1. The specified product shall be a high-resolution, PTZ HD Rapid Dome, 10X optical zoom, 360 degree pan rotation and a tilt range of 210 degrees, Day/Night network camera assembled into a rugged, sealed outdoor IP66 and/or NEMA 4X rated enclosure designed for both indoor and outdoor applications. The integrated camera is an industrial grade, color, and full-featured, day/night PTZ HD network camera.

The assembled unit shall consists of 1) a camera and lens module; 2) enclosure; 3) a wall, ceiling, or pole mounting, 4) heater/blower; 5) 120VAC in and 12VDC and 24VDC out power supply; 6) fiber optic media converter; and 7) a power/data connector back box.

The camera and heater/blower shall be powered by 12VDC output of the camera enclosure power supply. The fiber optic transceiver shall be powered by 24VDC from the camera enclosure power supply. The camera enclosure power supply shall be powered by 120VAC brought from the adjacent DC or CER. The 120 VAC power and communications single-mode fiber optic cables shall be run together within the same raceway.

The product shall be designed to meet or exceed industrial and surveillance applications requiring a low power, rugged PTZ video camera with IP network capability. The camera shall have a built-in web server and FTP server.

B. General Product Requirements

1. The specified product shall be a high-resolution, PTZ, Day/Night 1/3-inch HD CMOS optical format, network camera integrated into an all-weather NEMA 4X / IP66 rated enclosure designed for both indoor and outdoor applications.
2. The operating temperature range shall be -20 deg F to +145 deg F.
3. The integrated camera shall be an industrial grade, color, and full-featured, Day/Night, PTZ HD network camera with 1/3-inch optical format.
4. The camera shall be powered directly via 12VDC from the enclosure power supply.
5. The enclosure shall house the camera/lens (while enabling its PTZ features), 120VAC power supply; heater/blower unit; fiber-optic transceiver; and shall allow entry of cables that pass through watertight fittings, which include harsh environment IP67 or better cable seal strain relief connector ports.
6. Various types of mount shall also be available to accommodate various types of mounting surfaces (i.e. wall, ceiling, pole or parapet) and/or mounting installations.
7. The assembly shall provide both input and output alarm trigger connections.
8. The camera PTZ features shall include a built-in 10X optical, auto-focus zoom lens, and 12X digital zoom capability; and capable of 360 degree pan rotation and a tilt range of 210 degrees. Zoom movement speed shall be of approx. 1.0 second (optical wide to optical tele). Maximum pan/tilt speeds of 400° per second and minimum pan/tilt speeds of 0.1° per second
9. The camera shall provide for audio input/output: Microphone/Line In and Line Out
10. The camera assembly shall be vandal and tamper-resistant, featuring camera tampering detection function that alerts the operator if the camera is tampered with. Tampering can include spraying the camera lens, covering it with a cloth, or changing the mounting direction.
11. The product shall be available with any of the Integral 10X (5.1 to 51 mm) F1.8 to F2.1, Auto-focus zoom and IR compensated type lens.
12. To simplify camera setup during installation, an analog output for a display monitor shall be accessible when the lens housing is separated from the camera housing. TCP/IP protocol video output via a RJ-45 Ethernet connection and an NTSC (PAL) analog video output via a BNC connection outputs may be used simultaneously.

13. The fiber optic transceiver/media converter shall convert incoming (over two fiber optic single-mode strands terminated with SC connectors) 100BASE-FX (1310 nm) signal into traditional copper 10/100BASE-TX (RJ-45) signal connecting to the camera network port. The media converter shall be powered by 24VDC output of the enclosure power supply.

C. Camera Specifications:

1. The Day/Night high-resolution color camera specified shall incorporate a progressive scan CMOS imager with a 1/2-inch optical format, with 720p HD resolution.
2. The image resolution shall be minimum 1280(H) x 720(V) pixels. The camera shall produce 30 frames per second (fps) at full 1280(H) x 720(V) resolution in 16:9 aspect ratio. It shall use JPEG, MPEG-4 and H.264 Triple Codec video-compression. The images can be viewed via a standard browser.
3. The camera shall incorporate a built-in 10X optical and 12X digital zoom capability with integrated 5.1 to 51 mm F1.8 to F2.1 auto-focus zoom lens.
4. Minimum light requirement to produce a color image shall be approximately 1.9 lux. When in the Night mode, less than 0.17 lux will produce a black and white image. The video signal-to-noise ratio shall be more than 50dB.
5. The camera shall provide automatic white balance, automatic exposure, gain control, electronic shutter, and backlight compensation.
6. The camera shall be capable of guard tour, which can be used to program up to sixteen (16) presets and moves to each preset sequentially when guard tour is activated. It shall be capable of shadow tour, which is used to learn an operator's PTZ control actions (including those made with a joystick) and then repeats the motions on command
7. The camera shall be capable of recording image and sound files on the 8 MB of built-in memory or transferring the files to an FTP server. The camera shall have a built-in compact flash card slot to allow the use of additional compact flash memory, or allow the use of the manufacturer specified compact flash wireless LAN card (SNCA-CFW5). The Contractor shall provide for suitable 32GB card (minimum) for additional storage of the camera data.
8. The camera shall have RS-232C, RS-422, and RS-485 interfaces and support the Pelco D and VISCA Protocol. It shall also have a 14-pin I/O interface located on the rear of the base. There shall be four alarm input ports, and two Alarm/relay output ports. The Alarm input port shall be opto-isolated.
9. The camera shall be capable of 360 degree endless pan rotation and a tilt range of 210 degrees with maximum pan/tilt speeds of 400 degrees

per second and minimum pan/tilt speeds of 0.1 degrees per second. It shall incorporate a built-in 10X optical and 12X digital zoom with zoom movement speed of approximately 1.0 second (optical wide to optical tele). The camera shall have ten (10) user defined presets, with a repeatable mechanical preset accuracy of  $\pm 0.045^\circ$  (typical). It shall be capable of an e-flip function, a feature when the camera passes the down position, electronically flips the image 180 degrees.

10. The camera shall provide for built-in Intelligent Motion Detection (IMD) capability. To minimize false triggers, the IMD shall compare the current image with prior 15 frames within the camera. The IMD algorithm shall allow the camera to discriminate against some environmental noise such as shaking leaves or AGC noise. IMD function shall support at least five Video Motion Filters (VMF) to trigger alarms based on pre-defined rules. The camera shall have a "camera tampering" detection function that alerts the operator if the camera is tampered with. Tampering can include spraying the camera lens, covering it with a cloth, or changing the mounting direction.
11. The camera shall provide on-screen, digital, pan/tilt/zoom on live video.
12. Provide User and Administrator password protection levels.
13. The camera shall be capable of masking up to thirty two (32) privacy areas and provide for image cropping.
14. The camera shall capture image sequences by time lapse intervals or trigger events and transfer the jpeg images via FTP and/or e-mail.
15. The camera shall support IEEE-802.1X authentication.
16. Provide any specialized software required for setup and optimization of the camera.

D. Camera Networking Requirements

1. The camera shall support 10/100BASE-TX communications and incorporate a built-in web server, built-in FTP server, and a built-in FTP client.
2. Camera functionality shall be available to users running versions of Java VM and web-browser applications released after January 1, 2004.
3. The camera shall provide integrated support for TCP, IPv4, IPv6, DNS, RTP/RTCP, RTSP, UDP, ARP, HTTP, HTTPS, ICMP, SMTP, FTPs, FTPc, DHCP, NTP and SNMP (MIB2) protocols. Network security shall be via Password (basic authentication) and IP filtering.
4. The camera shall be capable of supporting up to ten (10) users simultaneously over the network. It shall be capable of dynamic IP address change notification. It shall accomplish this via an email to a specified address or by HTTP when its IP address changes.

5. The camera shall be compliant with the ONVIF (Open Network Video Interface Forum) specification.
  6. The camera shall be user configurable and the administrator may functionally or aesthetically modify the camera's web pages.
  7. The camera shall have up to six user-specific level settings. The camera shall have an Adaptive Rate Control (ARC) function when using MPEG-4 and H.264 compression. This function when enabled, shall allow the camera to maintain the frame rate at a reduced image quality when network congestion occurs. Should network bandwidth become further restricted, the frame rate shall then drop automatically to a suitable speed to maintain image integrity.
  8. The camera shall offer a web interface, 802.1X authentication; support QoS technology and user configurable port settings.
- E. Camera Recording/Playback Requirements:
1. The manufacturer shall offer optional, licensable embedded recording/playback software that allows images to be recorded to an external FTP server or locally to on-camera an asbuilt memory or media card.
  2. Images may be stored at a fixed periodic record rate and/or when triggered by motion and/or external input. Playback shall allow all images recorded to be viewed forward or backward in time.
  3. Recorded images and data storage shall be no less than 14 days.
- F. Camera Event (Alarm) Handling Capability:
1. The camera shall be capable of recording an event as pre and post event images to an asbuilt memory or an on-board Media Card. The camera shall also be able to transfer the event's JPEG images to an FTP server via File Transfer Protocol (FTP). Events may be triggered using camera motion detection or from an external device input such as a relay.
  2. When triggered from an external input or the camera's motion detector, the camera shall be capable of sending JPEG images via e-mail and/or sequences of images to an FTP server.
  3. A relay output shall be available upon the activation of the camera's motion detector or external relay input. The relay output may also be manually activated from the live view screen.
  4. The camera shall support Voice alert function, which can automatically play an audio file stored on the camera by an alarm trigger using motion detection, DEPA Advanced VMFs, camera tampering detection or via a sensor input

- G. Camera Connections:
  - 1. RJ-45 Ethernet connector
  - 2. Punch Down terminal for CAT5, CAT5e, or CAT6 cable
  - 3. Screw terminal: Direct power for 12VDC or 24VAC
  - 4. Analog video: 75 Ohm BNC connector
  - 5. Analog installation setup port: RCA Female
  - 6. Card Media Slot
  - 7. Alarm I/O terminals
  - 8. Audio: mini-jack connectors to support external microphone and active speakers
  
- H. Camera Electrical Specifications:
  - 1. Power Consumption: 30 watts maximum
  - 2. Power requirement: either AC 24V or DC 12V
  
- I. Camera Mechanical Specifications
  - 1. Dimensions: approximately 6 1/8 inches (Dia.) x 9 inches (H) (not including the projecting parts)
  - 2. Lens: As required by the application
  
- J. Camera Environmental Specifications
  - 1. Temperature range: +32 deg. F to +122 deg. F
  - 2. Operating humidity: 20% to 80% (non-condensing)
  
- K. Camera Enclosure Requirements
  - 1. Camera Enclosure shall be designed to provide for a fully functional housing for the CCTV Ethernet network camera specified herein.
  - 2. It shall be designed for CCTV cameras for commercial, industrial, or government applications requiring a rugged, sealed outdoor rated camera enclosure with compatibility to house a broad range of Pan Tilt Zoom (PTZ) or fixed Mini-dome cameras that are commercially available for IP, and High Definition, and CCTV capability. The Camera Enclosure shall be minimal outdoor protection rating of IP66 and/or NEMA4X. The Camera Enclosure shall include harsh environment IP67 or better Cable Seal strain relief connector Ports.

3. The housing will provide power to compatible cameras @ 12 VDC & 24 VDC, and environmental control board for providing power to protective elements which could include two high output 10 CFM Fans, and integrated internal dual ply foil & foam insulation for optimal thermal protection
4. It shall provide integrated capacity for bolt on wall and/or compatible with optional brackets with capacity for strap mounting pole mounting of enclosure. Provide for provision of any necessary mounting and cable management equipment to provide for a fully functional PTZ Camera assembly.
5. The Camera Enclosure shall be compatible with a media connection cable of Category 5 and/or Category 5 Enhanced and/or Category 6 twisted pair (UTP) cable, using RJ45 compliant connectors, & CCTV coaxial cabling.
6. Housing Power:
  - a. Source Supply Voltage @ enclosure: 95-264VAC & 20-30VAC/VDC
  - b. Voltage available to power Camera and accessories; 12VDC @ 25 watts max, and 24VDC @ 25 watts maximum. Total sum power to camera or accessories is 50 watts maximum.
7. Housing Mechanical Specifications:
  - a. Exterior 14.9" (L) x 13.4" (H) x 11.7" (W)
  - b. Interior: 8.6 (dia @ mount base) x 9.3 tall (6.8 dia. max @ lens) (maximum camera size)
  - c. Hinged Lower with Captive Stainless Steel Fasteners
  - d. Rugged Polycarbonate Housing (0.160" wall)
  - e. Clear Acrylic Viewing Lens bubble 6.8" dia. x 3.7" deep
  - f. White Semi-gloss finish to PC housing
  - g. Protective Urethane foam Gasket Seals
  - h. Integrated wall mounting tabs
  - i. Integrated Omni Antennae mounting tab on side
  - j. Certifications NEMA 4x / IP66
8. Housing Environmental Specifications:
  - a. Operating Temperature Range: -20 deg F to +145 deg F

- b. Housing shall meet or exceed a rating of NEMA4X and/or IP66
  - c. Housing shall have two cable entry ports rated to IP67 for power & data cables
  - d. Housing shall be suitable for deployment into wide range of moderate environments of Residential, Commercial, Industrial, Marine, Desert, and other indoor & outdoor installations.
- L. Industrial Mini Media Converter Requirements:
- 1. Industrial Mini Media Converter shall be designed to provide for a fully functional fiber-to-copper Ethernet communications conversion for the CCTV Ethernet network camera specified herein.
  - 2. Industrial Mini Media Converter shall provide for integration of fiber optic cabling into industrial or outdoor 10/100 UTP Ethernet networks. It shall feature wide operating temperature range, low-voltage DC power, multiple mounting methods and lifetime warranty, and shall be designed for harsh outdoor or industrial applications.
  - 3. General Features:
    - a. Unit and Port LEDs to provide quick status
    - b. Auto-Negotiation
    - c. Fixed Full-Duplex on fiber
    - d. AutoCross™ on copper port
    - e. Link Pass Through
    - f. Automatic Link Restoration
    - g. Far-End-Fault
    - h. DC Powered
  - 4. Specifications:
    - a. Fiber Ethernet Signal: 100BASE-FX, 1310 nm with link budget: 16.0 dB and max distances: 12.4 mi
    - b. Fiber Connector type: SC
    - c. Fiber type: Single Mode
    - d. UTP Ethernet Signal: 10/100BASE-TX
    - e. UTP Ethernet Connector type: RJ-45

- f. Status LEDs: PWR (Power); FX-Link/Act (Fiber Link/Activity); TX-Link/Act (Copper Link/Activity)
- g. Dimensions: Width: 1.8" x Depth: 3.3" x Height: 0.85"
  - h. Power Consumption: 2.5 watts
  - i. Power Sources: 12-48VDC
  - j. Operating Temperature: -40°C to 75°C
  - k. Humidity 5% – 95% humidity non-condensing
  - l. Regulatory Compliance FCC Class A, CISPR22/EN55022
  - m. Class A, EN55024, CE Mark
  - n. Warranty: lifetime
- M. The following equipment shall be used:
  - 1. IP camera shall be Sony model SNC-RH124 or Caltrain approved equal
  - 2. IP camera outdoor housing shall be Dotworkz model D2 Tornado with MVP Multi-Volt Platform or Caltrain approved equal
  - 3. The Industrial Mini Media Converter shall be Transition Networks model M/E-ISW-FX-01(SM) or Caltrain approved equal

## 2.05 CABLING

- A. Furnish and install a UTP Category 6, 4-pair cable with RJ45 connectors between the assigned Distribution Cabinet or CER and the camera location.
- B. Furnish UTP cables that are terminated at the CCTV camera end and at the surge suppressor at the cabinet's or CER's point of entry. Install the cable from the CCTV camera end to the cabinet termination point leaving sufficient slack in the cable for normal camera operation and maintenance. Provide slack cable in the CCTV cabinet in accordance with the design.
- C. Provide cables to connect from the UTP or composite cable termination points (i.e., termination point with surge suppressors) to the redundant Ethernet switch located in the assigned Distribution Cabinet or CER.
- D. Where design prohibits use of UTP cabling (due to cabling distances exceeding 300 ft or high EMI levels) furnish, install and terminate a 4-strand single-mode fiber cable. Such installation shall be accompanied by the corresponding installation and termination of the CCTV 120VAC UPS-backed power wiring and shall be routed in separate raceways from the power wiring for the station's remaining subsystems. The corresponding standard Media Converter or Media Converter with IEEE802.3af PoE/PSE supply (i.e. Etherwan model EL1032 or Caltrain approved equal) shall be implemented on the receiving end as per the project design.

- E. As a part of the Design Submittals, prior to installation and termination of the CCTV System conduits and cabling, submit to Caltrain for approval the conduit and cabling labeling scheme. See Caltrain Standard Specifications Section 17050, Basic Communications Equipment, Material and Methods.

## **2.06 CCTV MOUNT**

- A. Furnish and install the CCTV camera assembly-mounting arm at locations as shown on the Contract Drawings and all necessary attachment hardware, grounding and miscellaneous hardware. The mounting arm shall mate with the CCTV assembly support pole.
- B. A conduit passageway through the pole at the camera-mounting arm shall be used to pass the UTP and/or, where applicable, other cables through the pole to the CCTV mounting arm and then into the CCTV camera assembly.
- C. The cabling may be a combination CCTV communication and power cables. The arm shall completely conceal all cables so there is no exposed wiring outside the pole, cabinet and camera.
- D. The attachment of the CCTV camera assembly to the mounting arm and the electrical connections and the attachment of the arm to the camera support structure shall be in accordance with the camera manufacturer's installation recommendations. The arm mounting to the support pole shall not use "U" bolts or banding as the attachment hardware.
- E. The design of the attachment hardware shall provide a secure connection between the pole and the camera-mounting arm. The design and fabrication of the CCTV mounting arm to support pole hardware shall be submitted for review and approval to the Engineer. Provide a Caltrain approved CCTV assembly-mounting arm that meets the structural, functional and aesthetic needs of the project. The required mounting arm may or may not be an off the shelf product provided by the CCTV camera assembly manufacturer or vendor. It shall be acceptable to design and have fabricated a specialty arm that shall meet the specific needs of the project subject to Caltrain's approval.

## **2.07 NETWORK DIGITAL VIDEO RECORDER (DVR)**

- A. General Product Description:
  1. This description lists the technical specifications for the station video Nextiva Recorder Server.
  2. All software components shall be part of the manufacturer's standard software product offering. All software components shall be thoroughly tested and proven in reference installations. The Network Video Recorder solution shall be DHS certified as an anti-terrorism technology.
  3. The station DVR solution shall have flexible, open architecture built on accepted industry standards that support a Workgroup Windows Environment; Active Directory Domain Environment and unified workstation logon based on Windows authentication. The station DVR shall have flexible configuration architecture that facilitates video

resolution transcoding in order to stream video in a low bandwidth connection to the Review and Client SDK applications.

4. The specified product is an all-in-one multichannel (a channel per a camera) Network Video Recorder, providing for recording, local and remote surveillance; intelligent video analytics and enhanced file security by digital watermark required by the station CCTV System.
5. For recording functions, the device supports continuous/ manual/ schedule recording; alarm recording (by motion detection or sensor triggered); multiple alarm recording schedules; megapixel recording; Motion-JPEG, MPEG-4, MxPEG and H.264 recording; audio recording (vary by camera models).
6. For surveillance functions, the device supports diversified modes for live monitoring; smart control of PTZ cameras and auto cruising; event notification on monitoring; real-time SMS and email alert; multi-channel playback at different speed; easy data search by date & time, timeline, event, and intelligent video analytics (motion detection, foreign object, missing object, out of focus, and camera occlusion).
7. The station DVR shall provide support for IP (network) cameras from multiple third party manufacturers and various encodings including MJPEG, MPEG-4 and H.264.
8. The station DVR shall support video motion detection natively. This operation can be executed by the edge device or the IP Camera. Enabling motion detection shall be performed either: on a continuous basis; scheduled for particular times, dates, days, months, etc.; defined areas of interest through an easy-to-use user interface using simple editing tools; and/or at a defined level of sensitivity.
9. The Recorder shall use standard COTS (Commercial Off-The-Shelf) server technology and storage attachments including certified for EMC storage solutions. Video storage implementations for the station DVR shall be either be internal, external SCSI-attached, external Fibre Channel-attached, or external iSCSI SAN (depending on the application's functions, storage and performance requirements).
7. The station DVR solution shall be capable of supporting multiple site locations linked via LAN / WAN connections.

B. Station DVR Interfaces:

1. The station DVR shall support the ability to support third-party IP cameras via the Service SDK which can be used to develop adaptors for any IP camera.
2. The station DVR shall support H.264, MJPEG and MPEG-4 compression from edge devices and IP cameras.
3. The station DVR shall support H264 de-compression on the Workstations.

4. The station DVR shall support an unlimited number of dry-contact inputs.
5. The station DVR platform shall support an unlimited number of dry-contact outputs.
6. The station DVR shall operate over a Local Area Network (LAN)/Wide Area Network (WAN), using a standard Ethernet 100/1000 Base-T connection.
7. The station DVR shall support either or both Unicast or multicast over the enabled network.
8. The station DVR shall transmit video using the UDP/IP or TCP/IP communication protocol.
9. The station DVR shall transmit all command and control messages using the TCP/IP protocol.
10. The station DVR shall generate alerts on disabled camera inputs.
11. The station DVR shall support the ability to support third-party keyboards via the Service SDK which can be used to develop adaptors for any third party Keyboard.
12. The station DVR shall support additional PTZ Keyboard Camera Commands such as:
  - a. Call up Patterns
  - b. Camera Menu Commands
  - c. Auxiliaries
  - d. Home Position
  - e. Flip Camera 180 degrees
13. The station DVR shall support all station CCTV equipment installed under the current project.
14. The station DVR equipment shall be fully compatible with the existing Caltrain Nextiva CCTV Hardware and Software Head End located at Caltrain Headquarters in San Carlos.

C. Station DVR Requirements:

1. The station Recorders shall store video on COTS equipment using hard drives as storage medium. The recorders also have the capability to support the attachment of external storage devices.
2. The station Recorders shall be certified with optional EMC storage solutions.

3. The station Recorders shall be certified to Record in VMware environment.
4. The station Recorder Server shall be configured to run Master Server functions, Recording, Storing, Media Gateway Server, Live View and the Review applications simultaneously (including simultaneous support of multiple users/streams/views) for cost-effective deployments. The Contractor shall select vendor-recommended hardware and software for the station DVR to be able to support such performance requirements for multiple simultaneous tasks operations (with no task interfering with any other task).
5. The Recorder shall run autonomously and continue to Recorder once configuration is received.
6. The Recorder shall support the ability to fail-over to another recorder or group of Recorders dynamically without user intervention.
7. The station Recorder Server shall have the ability to record simultaneously all station cameras at their maximum resolution and the lowest level of compression (maximum quality); and store the recorded CCTV video at the local station storage for at least 14 days. Also, to support future growth, the performance and storage of the station DVR equipment shall be rated to handle additional 50% of similar station CCTV equipment. As a part of the design submittals, submit all necessary calculations for performance and storage requirements of the CCTV system and identify adequate and up-to-date equipment/software similar to the lists below.
8. The station DVR and, if applicable, external storage shall utilize High Reliability and Smart Features, such as:
  - a. Advanced RAID (RAID 5/ 5 + hot spare/ 6/ 6 + hot spare/ JBOD) with hot-swap design
  - b. Large storage capacity for long-term recording
  - c. Intelligent auto power on when power resumes after power outage
  - d. Supports UPS for 24x7 service
  - e. Two Gigabit LAN ports for failover, load-balancing, or multi-IP setting
9. The minimum requirements for a server hosting Master Server and Recorder services with internal storage are listed below.
  - a. Processor and Speed: Vendor recommended microprocessors based on up-to-date available hardware and to meet functional requirements above

- b. Memory: Vendor recommended memory type and size based on the up-to-date available hardware and to meet the functional requirements above
  - c. Boot Drive: 2 X 80 GB SATA in RAID 1 configuration
  - d. Video Storage Drives: SATA with capacity and redundancy as specified
  - e. Operating System:
    - i. Win2003 SE Server R2 , SP1 or SP2
    - ii. Windows 2008 SP2
  - f. Video Card: 128 MB RAM, 1024x768
  - g. NIC: 100/1000 BASE
  - h. 8X DVD Writer
10. The minimum requirements for a server hosting a Master Server and Recorder with external storage for video are listed below:
- a. Processor Speed: Vendor recommended microprocessors based on up-to-date available hardware and to meet functional requirements above
  - b. Memory: Vendor recommended memory type and size based on the up-to-date available hardware and to meet the functional requirements above
  - c. Boot Drive: 2 X 80 GB SATA in RAID 1 configuration
  - d. Operating System:
    - i. WIN XP + SP2
    - ii. Win2003 SE Server R2 , SP1 or SP2
    - iii. or Windows 2008 SP2
  - e. Video Card: 128 MB RAM, 1024x768
  - f. NIC: 100/1000
  - g. 8X DVD Writer
11. Media Gateway Server requirements:
- a. In order to enable live views at the Caltrain Headquarters headend of the station's high resolution cameras over the existing Caltrain low-bandwidth WAN links (partial T1 lines

between stations and the Caltrain Head End CCTV equipment), the station DVR shall provide for the Media Gateway functionality.

- b. The Media Gateway Server shall be capable of running all video transcoding and WAN transport services. The Media Gateway Server shall transcode received video from IP cameras or edge devices at a certain resolution and then convert and send the low resolution video through a bandwidth limited WAN link.
- c. The Media Gateway shall properly packetize video to transverse NAT's and Firewalls using IP with a maximum of 2 ports.
- d. The Media Gateway shall support Review User Priorities when multiple remote Review user requests for video exceed the bandwidth of the WAN/LAN link.

D. Station DVR General Software Requirements

- 1. The station DVR shall have a graphical user interface (GUI) that allows the user to quickly configure and apply the following parameters:
  - a. All cameras configurations
  - b. All recorder configurations and resolutions
  - c. All work schedules
  - d. User and access rights and privileges
  - e. Create schedules and apply them to specific camera groups
  - f. Configure cameras and recorders individually and as a group in system components
  - g. Support event management and recording; establishment of rules and follow up actions
  - h. Video storage locations, settings and schedules; and management of long-term storage and archiving
  - i. Add and edit interactive site plans and Maps
  - j. View live video, retrieve recorded video, and export video into desirable media (authenticate video to enable users to verify that the video has not been modified since it was recorded). This includes viewing of live or historical alarm events and the associated video by scanning of recorded video for activity thru an energy graph that indicates levels of activity.
  - k. Manage multiple windows (up to 16) and the associated rules and priorities

- l. Control PTZ cameras and configure PTZ presets/patterns/tours
  - m. Group cameras and maps at and define multiple levels of groups and maps
  - n. Support digital zoom on live or recorded video, without requiring a video pause
  - o. Manage images' date and time, text annotation, adjust the brightness and/or contrast; smooth, sharpen, grayscale and other filtering
  - p. Select video to be exported and from a precise start time and end time
  - q. Save the image to disk in various standard file formats
  - r. Be video analytics ready
  - s. Support failover/redundancy (where required)
  - t. Configuration of the Media Gateway functionality for downscaling high resolution video-streams into resolutions of lower quality and lower bandwidth requirements for live view of such images at the Caltrain CTV Head End via the low bandwidth (partial T1) WAN links to the stations
  - u. Support setup of health check settings for live monitoring and detailed system performance metrics on system components, including all server-side software applications, edge devices, and cameras (including cameras' out-of-focus, tampering detection and full/partial blockage of the view)
- 2. Prior to implementation and configuration of the station DVR, for each Design Review Level, submit for Caltrain's approval the proposed settings for all software functions described above.
- E. Product, Server and Storage requirements:
- 1. The station DVR shall be Verint Nextiva Recorder Server with internal storage on the Dell PowerEdge R710 platform (or the most current approved substitute), and the Nextiva Recorder Server with external SCSI or Fibre Channel storage on the Dell PowerEdge R410 platform (or approved up-to-date hardware platforms recommended by the vendor). The chosen platforms shall meet the storage and performance requirements listed within these specifications (based on the Contractor calculations and approved by the Caltrain).

## **2.08 UPDATES TO THE CALTRAIN EXISTING CCTV HEADEND SOFTWARE**

- A. As a part of the Design Submittals, submit to Caltrain for approval the IP addressing scheme and security scheme for all station CCTV System elements.

- B. Caltrain will program into the existing Caltrain CCTV Head End Verint software the new station CCTV cameras, DVRs and other CCTV network elements. The Contractor shall assist the Caltrain personnel with the integration (and the associated configuration/testing) of the station CCTV equipment into the existing Caltrain CCTV Head End.

### **PART 3 - EXECUTION**

#### **3.01 INSTALLATION**

- A. At locations where new cabinets are installed, new UPS electrical services shall be installed as shown on the plans. The new electrical services shall be sized to accommodate the equipment to be installed in the cabinets.
- B. Where multiple subsystems devices share the same pole or location, provide separate Category 6 or fiber optic cabling and conduit per device. Subsystem devices shall not share cables conduits, or other pathway.
- C. Integrated Camera Assembly: Install an integrated camera assembly, UTP or composite cable, camera interface panel, and camera-mounting arm at locations as show in the Contract Drawings.
- D. Where cameras are located less than 9 feet above the surrounding ground surface physical protection shall be utilized to protect them from vandalism.
- E. No field cabinets shall be used for the CCTV at camera positions. The CCTV camera shall stand alone with Category 6 or fiber optic cable connectivity to its assigned Distribution Cabinet or CER (whichever is closer or practical).
- F. CCTV Assembly Installation:
  - 1. Mount the CCTV assembly on the mounting arm in accordance with the manufacturer's recommendation and at locations as shown in the site specific drawings. Install the camera assembly UTP or composite cable in accordance with the routing as shown in the Contract Drawings. Make all necessary cable connections.
  - 2. Feed all cable connections from the CCTV Camera assembly leaving sufficient slack in the cable for normal movement and maintenance of the CCTV camera assembly. After installation and cable termination an initial test shall be performed to confirm that the camera has been installed properly and functions correctly from the CCTV cabinet location. This initial test is not a replacement or substitute for any acceptance test.
  - 3. Perform the CCTV assembly manufacturer's initial power-on test in accordance with the manufacturer's recommendation. Ensure that the camera assembly receives all pan/tilt/focus/zoom telemetry settings by exercising the camera assembly to verify each telemetry function.
  - 4. Perform additional testing conforming to any other CCTV camera manufacturers recommended procedure to confirm that the initial functionality is operational. With either a test monitor or other device as

recommended by the CCTV Camera assembly manufacturer confirm that a video image is present from the installed camera assembly.

G. CCTV Mount:

1. Furnish and install a mounting bracket for a pole mount, which includes the pole attachment hardware, clamps, bolts and bracket arm. "U" bolts and strap supports will not be allowed.
2. Mount the CCTV mounting bracket at the cardinal direction as shown in the Contract Drawings. Ground the mounting arm as shown in the Contract Drawings.

H. CCTV Connectivity:

1. Install CCTV camera to include UPS power receptacles, dc power supply, terminal strips, lightning and voltage suppressors, grounding strips, and internal wiring.
2. Connect camera UTP or fiber-optic cable connector(s) to integrated camera assembly per manufacturer installation manual. Terminate camera cables in cabinet as follows:
  - a. Power: Terminate ac/dc+, ac/dc-, and ground wires and connect to camera power supply surge suppressor provided in cabinet. All CCTV equipment shall utilize UPS backed power.
  - b. Fiber Optic Communications: Fiber Optic cabling shall be 4 strand single-mode cable suitable for outdoor installations and made of non-metallic elements. Terminate all 4 strands of the single mode fiber optic cable with SC connectors at each end of the cable. Connect two of these strands to the fiber optic transceiver / media converter inside the camera enclosure and at the corresponding media converter at the Station LAN redundant Ethernet switch within DC or CER (whichever is closer). These two strands will be used for the video communications and the remaining two strands will serve as "ready to use" spare.
  - c. Video: During the initial field setup, if available, terminate coax cable with BNC connector as per manufacturer recommendations. For UTP cable, use RJ45 connectors.
  - d. Wiring, Conductors and Terminal Blocks: Use stranded copper for all conductors, including those in jacketed cables, except for earth ground conductors, which shall be solid copper. Neatly arrange all wiring, firmly lace or bundle it, and mechanically secure the wiring without the use of adhesive fasteners. Route and secure all wiring and cabling to avoid sharp edges, and conflicts with other equipment or cabling. Route camera copper communications wiring separately from 120Vac wiring. Terminate all wiring on a terminal block, strip, buss bar or device clamp or lug; do not splice any wiring. Use a minimum #12 AWG for all conductors for 120 Vac circuits except for the 120

VAC supply circuit for the camera and pan/tilt unit. The gauge of the power wiring for the PTZ camera assemblies shall be determined by the voltage drop and conduit fill ratio calculations. The minimum gauge for the PTZ camera assemblies' power wiring shall be #16AWG. Install all wiring as shown in the Contract Drawings.

- e. Neatly dress the cables in the cabinet, and reach the connectorized end to the mating connectors on the camera assembly with 3 foot slack. Cut unused conductors in the cables to the same length as the assigned conductors. Bend back the unused conductors over the outer jacket and individually tape them in a manner to prevent pinching by the CPC strain relief clamp.
- f. All cables used in the cabinet are UL- listed tray cable with PVC/nylon insulation and UV-resistant PVC outer jacket rated for 600 V, 194 degrees F dry; 167 degrees F wet and wet/dry direct burial use. All furnished wiring used to complete the installation are to be rated at or above these minimum values. Video signal cable, when used, shall be high- flexibility double-shielded with tinned copper braid, #22 AWG stranded copper center conductor, and PVC outer jacket. Use BNC connectors on the video signal cable only as recommended by the cable manufacturer. Confirm during testing that this two-way data path is present and active. For IP fixed cameras, UTP cable shall be TIA/EIA Category 6, 4-pair solid conductor, rated CMR and placed in metallic conduit between the network distribution cabinet and camera assembly.
- g. Dress and route grounding wires separately from all other cabinet wiring. Install grounding wires with the absolute minimum length possible between the suppressor and the ground buss bar. Label all surge suppressors with silk-screened lettering on the mounting panel.
- h. The cabinet shall be furnished with three-stage transient surge suppressors for protecting the camera control/feedback, video output, and power supply lines. These suppressors shall be in addition to the suppression provided by the CCTV camera equipment. For IP fixed cameras, UTP shall be protected at the network distribution cabinet with 4-pair solid-state protection rated for Category 6.
- i. Install electrical cables used for video, control, communications signaling and power supply as shown in the Contract Drawings. Do not splice any cable, shield or conductor used for video, control, communications signaling, or power supply. Identify all conductors of all cables by color and number. Identify the conductor function in as-built documentation included in the cabinet documentation. Terminate cable used for analog video signaling in BNC connectors. After termination and dressing the cables in the cabinet, neatly coil and store a minimum of 3 foot

(.61m) of cable slack in the bottom of the cabinet. Cut unused conductors to a length that can reach any appropriate terminal. Bend back the unused conductors over their outer jackets and individually tape them.

- j. Where used, provide a single UPS 120 / 24 Vac (60 Hz) power source to the camera assembly from the equipment cabinet to supply both the camera and the heater in the camera housing.
  - k. Install cabling between the CCTV camera assembly and the network distribution cabinet inside support poles, conduit, or structures as shown in the Plans. Use weather heads on all nipple and conduit openings. Neatly install and route cabling to minimize movement in the wind and chafing against the pole, device or bracket. Form a drip loop at the weather head and route cabling to minimize water entry into the cable connector. Lash cabling mounting arm and route into camera and pan-tilt unit.
- I. Connect data cables from the CCTV equipment to the station LAN and configure the station DVR with approved settings for cameras, storage and other CCTV system related settings to make complete and fully functional station CCTV system.
  - J. Assist Caltrain personnel with incorporation of the new station CCTV equipment into the existing Caltrain CCTV system to ensure full integration of the new CCTV equipment.

### 3.02 TESTING AND INSPECTION

- A. Acceptance testing consists of three phases: Field Installation Testing, CCTV System Site Testing, and Burn-in Period.
- B. Field Installation Test:
  - 1. Perform the Field Installation Test as an onsite test of the complete field installation assembly less the communications components. No acceptance testing at a given site can begin until all work associated with that site is complete, not including the communications components. For the field equipment installation test, a PC laptop system, camera control receiver-vendor control software (Caltrain provided) and a 13-inch or larger color video monitor shall be used to demonstrate full operation of the CCTV site. Proper operation is to include pan, tilt, focus, zoom, iris, and position feedback and communications address configuration.
  - 2. Perform local field operational tests at the device field site and end-to-end video streaming tests in accordance with the test procedures below:
    - a. Verify that physical construction has been completed as detailed in the plans
    - b. Inspect the quality and tightness of ground and surge protector connections

- c. Check power supply voltages and outputs
  - d. Connect devices to the power sources
  - e. Verify video image presence and quality with a vector scope and a portable NTSC approved monitor and DVD
  - f. Exercise the pan, tilt, zoom, focus, iris opening, manual iris control selection and operation, low-pressure alarm (if present), preset positioning, and power on/off functions
  - g. Demonstrate the pan/tilt speed and extent of movement to meet all applicable standards, specifications, and requirements
  - h. Demonstrate the ability to support IP unicast and multicast SAP and QoS
  - i. Configure the DVR IP addresses for video and data input
  - j. Verify proper voltages for all power supplies
  - k. Interconnect the communication interface device into the communication network's assigned fiber optic cable and verify network transmission activity.
- C. Test the installed CCTV assembly at the bottom of the pole from the camera cabinet using test procedures specified herein and recommended by the CCTV camera assembly manufacturer.
- D. CCTV System Site Test:
- 1. After the completion of the associated copper or fiber optic communication connection between the CCTV camera assembly and the associated DC cabinet to the station equipment room (CER), perform the CCTV System Site Test to demonstrate proper CCTV system performance at the CER. The CCTV System Site Test shall be performed only after successful completion of the field installation test. Proper operation is to include a satisfactory video image, areas of coverage, pixel per foot level of detail, camera/lens control, if applicable, PTZ controls, and communications operation from each CCTV site to the CER and Caltrain San Carlos CCTV Head End.
  - 2. Test of all software functions of the station DVR for compliance with the Caltrain Engineering approved requirements and settings for the Station DVR hardware and software.
  - 3. The demonstration shall use the central CCTV software and control center and communications system to demonstrate the compatibility of the CCTV equipment installation in its permanent configuration. Proper operation is to include a demonstration of proper data communications integrity with a communication protocol analyzer.

4. Caltrain shall witness and record the test data, date and time of successful completion of the test.
- E. Burn-in Period:
1. The Burn-in Period starts after the Caltrain Engineering accepting the completion of the Field Installation Test and completion of the CCTV System Acceptance.
  2. Any failure determined to be the result of faulty installation materials or workmanship shall be cause to restart the burn-in period. Correct any faulty material or workmanship that results found during the burn-in period. At the successful conclusion of the burn-in period Caltrain will accept the installation as complete.
  3. The burn-in period shall determine if the system is capable of recording and storing the station camera images at the highest resolution and at the highest frame rates required by the Station Design.
  4. The burn-in period shall be for a continuous 30 days and shall be performed for the station CCTV equipment as a whole.
- F. Test the new station CCTV equipment is fully compatible with the existing Caltrain CCTV Head End as per Caltrain approved requirements and settings.

**END OF SECTION**