

## SECTION 28 41 29

### CLOSED CIRCUIT TELEVISION SYSTEM

#### PART 1 - GENERAL

##### 1.01 SECTION INCLUDES

- A. Functional requirements.
- B. Equipment

##### 1.02 RELATED SECTIONS

- A. Section 01 33 00 - Submittal Procedures, and Contract Specifications
- B. Section 01 33 23 - Shop Drawings, Product Data and Samples
- C. Section 01 45 24 - Testing Program Requirements
- D. Section 20 70 26 - Common Materials and Methods for Electrical Systems
- E. Section 20 70 23 - Electronic Circuits, Wires, and Cables
- F. Section 20 50 13 - Raceways for Facility Services
- G. Section 20 72 25 - General Requirements for Factory and Field

##### 1.03 MEASUREMENT AND PAYMENT

- A. Measurement: The Closed Circuit Television (CCTV) system, as specified herein, will be measured for payment as a lump-sum unit acceptably installed and tested for compliance.
- B. Payment: The CCTV system will be paid for at the Contract lump-sum price for the CCTV system or as part of the lump sum price for Communications Work, as determined by the lump sum measurement specified above, as indicated in the Bid Schedule of the Bid Form.

##### 1.04 REFERENCES

- A. Electronic Industries Association (EIA):
  - 1. Bulletin #1 CCTV Definitions
  - 2. EIA-310D 19-inch Rack Standard
  - 3. EIA-568-A Commercial Building Telecommunications Cabling Standard
  - 4. EIA-632 Electronics Industries Alliance (EIA) Standard: Processes for Engineering a System
  - 5. EIA-649 Standard for Configuration Management

- 6. EIA-836 Configuration Management Data Exchange and Interoperability
- B. Institute of Electrical and Electronics Engineers (IEEE):
  - 1. IEEE Std. 1220-1998: IEEE Standard for Application and Management of the Systems Engineering Process
- C. Manufacturing Method (MM):
  - 1. MM-33A Process Control Specification for Paint Application
  - 2. MM-42 Process Control Specification of Chromate Conversion Coating
- D. Underwriters Laboratories (UL):
  - 1. UL 2044 Standard for Commercial Closed Circuit Television Equipment
  - 2. UL 2391 Equipment with Remote Feeding Telecommunication circuits Intended for Backwards Compatibility in Legacy Telecommunication Equipment
  - 3. UL 3044 Standard for Surveillance Closed Circuit Television Equipment
- E. National Fire Protection Association:
  - 1. NFPA 70 National Electrical Code
- F. California Occupational Safety and Health Standards (OSHA)

**1.05 SUBMITTALS**

- A. Refer to Section 01 33 00 - Submittal Procedures, and Section 01 33 23 - Shop Drawings, Product Data, and Samples, for submittal requirements and procedures.
- B. Submit the following:
  - 1. Systems design presented in functional block diagrams and system electrical/electronic signal flow diagrams indicating signal levels and impedance values.
  - 2. Product verification list with pictorial view and full performance specifications.
  - 3. Detailed installation drawings to include all installation configuration and methods of installation.
  - 4. List of proposed lenses for all camera installations. Calculations of coverage shall be provided for all cameras.

5. Operation and maintenance data to include operation instruction, detailed parts list, cable and wire lists, circuit diagrams, maintenance, alignment, and trouble shooting procedures.

#### **1.06 QUALITY CONTROL**

- A. Products shall be manufactured by firms regularly engaged in manufacturing products described in this section.
- B. Field testing shall be performed by persons having five or more years of relevant testing experience.

#### **1.07 SYSTEM DESCRIPTION**

- A. Furnish a CCTV system in the passenger stations for video surveillance of areas in the station, and adjoining parking structure, pocket track, tail tracks, trans-bay tube, and vent structures as applicable, and as indicated.
- B. Provide all interfaces with other systems in the station and in the BART network operating system, as specified and indicated, to provide a completely integrated operating system.

#### **1.08 FUNCTIONAL REQUIREMENTS**

- A. General:
  1. Average of 50 IP-based digital cameras per station, excluding parking structures where applicable.
  2. Video shall be in MJPEG format.
  3. There shall be no recording or storing of images at any stations.
  4. The BART Police Integrated Security Response Center (ISRC), also known as the BART Police Dispatch Center (PDC), will have supervisory control of the video software and be the primary location for displaying video. The Operations Control Center (OCC) will have two computer workstations and one large display in order to access and view video from the CCTV network.
  5. The PDC will have two computer workstations and two large displays in order to access and view video from the CCTV network.
  6. A maximum of six live or stored video streams will be viewable at any one time in the PDC and the OCC.
  7. Frame rates of 5, 10, 15, and 30 fps for live video will be available. Dispatch personnel will be able to select the frame rate for the stream they are viewing.
  8. MJPEG-formatted video will be stored at five frames per second in a storage area network (SAN) at the PDC. Stored video is limited to the most recent seven days.

- B. The CCTV system shall provide for video surveillance of areas in passenger stations, parking structures, pocket track, and end-of-line tail tracks as applicable.
1. Passenger Station Areas:
    - a. Platform and Mezzanine Areas. Cameras shall be furnished for viewing platform and mezzanine areas including rescue assistance areas and elevator entrances, as indicated. Cameras focused on elevator entrances shall be equipped with lenses having adequate coverage to allow viewing from the Station Agents Booth of patrons using the elevators. Cameras on platforms shall be oriented to allow viewing from the Station Agents Booth of the platform edges for the length of the platforms.
  2. Automatic Fare Collection Equipment:
    - a. Pan, tilt, zoom (PTZ) cameras shall be furnished to monitor automatic fare collection (AFC) equipment including the ticket vending machines, add fare machines, and bill-to-bill changers. "Door open" alarms provided with the fare collection equipment shall cause cameras to move to a position to monitor the alarmed machine. Automatic recording shall be initiated upon activation of the "door open" indication.
    - b. AFC equipment with "door-open" indications shall be monitored in order of priority.
    - c. When an AFC door is reclosed, the associated camera shall return to the normal preset position.
  3. Pocket Track and End-of-Line Tail Tracks:
    - a. PTZ cameras shall be furnished for viewing areas in the pocket and end-of-line tracks, as indicated.
  4. Parking Structures. Cameras shall be provided for viewing internal area and entry area of elevators and stairwell areas. Fixed cameras shall be furnished for viewing as directed by BART Police and BART Engineering.
- C. Interfaces of the CCTV system with other communication subsystems shall be as follows:
1. "Door open" indications of ticket vending machines, add fare machines, bill-to-bill changers, and parking machines for automatic positioning of video cameras shall be monitored by the supervisory control and data acquisition (SCADA) system. The SCADA system shall retransmit a contact closure to the associated PTZ camera to set the camera to a preset viewing position.
  2. Method of connection to the IP-based network designated for transmission of video images shall be determined by BART Engineering.

**PART 2 - PRODUCTS****2.01 EQUIPMENT REQUIREMENTS**

## A. General:

1. CCTV equipment providing the same functions shall be uniform and have the same type and model supplied by a single manufacturer.
2. All necessary accessories, devices, wires, and cables shall be furnished for proper interconnection of the equipment specified herein to provide a completely integrated and operational CCTV system.
3. CCTV monitoring and control equipment, as indicated, herein shall be furnished to allow monitoring of selected video images in the Station Agent's Booth, Emergency Management Panel Room, and the Supervisor's Booth at end-of-line stations.
4. CCTV equipment in the Train Control Room shall be designed for mounting in standard 19-inch rack per EIA RS-310D.
5. Convenience outlets with 120 VAC essential power shall be provided at each camera location.
6. CCTV network and storage will support up to the average of 50 IP-based cameras per station streaming data at 5Mbits/sec.

## B. Cameras:

1. Bandwidth requirements require that no BART station have more than 50 cameras connected to the IP-based CCTV network.
2. Cameras shall be Designated Matching Products; refer to Appendix A – Communication System Designated Matching Products.
3. Lens Mounting: All camera lenses shall be mounted on a standard CS-type mount with 1.0 inch in diameter and 32 threads per inch. Standard single type of mount shall be furnished.

## C. Camera Lenses:

1. Lenses shall be auto-iris lenses directly interchangeable without electrical or mechanical modifications or adaptations. Each lens shall have a neutral density spot filter. Lenses shall be capable of mounting in a sealed environmental housing.
2. Camera with zoom capability shall have a minimum of 20X optical zoom and 10X digital zoom.

## D. Camera Housings:

1. Cameras installed outdoors shall be furnished with environmental housings. The housings shall be equipped with heater kit, blower kit, and power supply. Housings exposed to direct sunlight at any time of day shall be equipped with a sun shield.
2. Cameras monitoring AFC equipment and those installed in elevators shall use a security housing with the following characteristics:
  - a. High security, vandal resistant, and corner mount type. The enclosure shall be tamper-proof with tamper-proof design subject to District approval.
  - b. The housing shall be compatible with the camera in the elevator.
  - c. Security enclosures shall be domed housings suitable for outdoor service. The housings exterior surface shall be tinted to conceal the interior camera from view.
  - d. The view from the housing shall encompass a 360 degree horizontal view and 45 degree vertical view. The vertical view shall extend from five degrees above the horizontal to 40 degrees below the horizontal.
  - e. Security enclosures shall be tamper-proof to prevent the general public from accessing the interior of the enclosure.
  - f. Tamper-proof designs shall be subject to District approval.

E. Camera Mountings:

1. Wall or Ceiling Mount: The camera mount unit shall be designed to support loads of up to 125 lbs. at an attitude of 90 degrees perpendicular to a wall surface. Each mount assembly shall be equipped with an adjustable head adapter that shall allow 360 degree horizontal and  $\pm 90$  degree vertical plane adjustment.
2. Pole Mount: Adapters shall be provided for placing standard wall or ceiling mount units on camera equipped poles. All parts shall be protected from corrosion.
3. The housing mounts for the elevator cab cameras shall be tamper-proof with tamper-proof design subject to District approval. The mounts shall be heavy duty that shall safely support a load of 120 pounds minimum.

F. Monitors:

1. Monitors less than 42" shall be a flat panel LCD type
  - a. Aspect Ratio: 4:3, 16:9
  - b. Resolution: Min. 1280 x 1024 (SXGA)
  - c. Response Time: Min. 12 ms
  - d. Contrast Ration: Min. 600:1

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- e. Refresh Rate: Min. 75 HZ
- f. Color Depth: Min. 16.2 Million Colors
- g. Brightness: Min. 250 cd/m<sup>2</sup>
- h. Pitch: Max. 0.294 mm
- i. Horizontal Viewing Angle: Min. 130 Degrees
- j. Vertical Viewing Angle: Min. 130 Degrees
- k. Interface Type: Audio – Line In, Video – 15 pin High-Density D-shell (VGA)
- m. Interface: Analog
- n. Monitor Color: Black
- o. Mounting: Desktop

2. Monitors 42" or larger shall be plasma displays.

- a. General specifications for plasma displays will be provided by BART upon request.

G. Video Servers:

- 1. Video servers run the software to process camera video for storage, perform analytics or interface with 3<sup>rd</sup> party video analytics, allow users to pick and control cameras, and provide per user video feeds.
- 2. Video server software will be Linux-based.
- 3. One server per station will be used.

H. Video Storage:

- 1. Video will be stored at centralized SAN storage facility designated by BART.
- 2. Preference will be given to systems utilizing open application programming interfaces (APIs) and open software development kits (SDKs).
- 3. Sufficient storage for 7 days worth of video stored at five fps.

I. Control Panel: Cameras will be controlled through the video manager software which is furnished by the District.

J. PTZ cameras shall have a minimum of 16 user-defined presets with a repeatable accuracy of + 0.2°. This shall include PTZ positioning, and camera focus.

- K. A contact closure from the SCADA system signifying a “door open” indication of a vending or add fare machine shall cause the appropriate camera to point and focus to the front of the pre-designated alarmed machine.
- L. Wires and cables between equipment assemblies and termination points within each equipment enclosure shall be furnished. Wires and cables shall be listed as being resistant to the spread of fire in accordance with the NEC, and shall be rated at 300 volts, minimum. Wires and cables servicing remote camera units shall be waterproof.
1. Video Cables: Video cables shall be as specified in Section 20 70 23 – Electronic Circuits, Wires, and Cables.
  2. Control Cables: Control cables shall be multi-conductor AWG No. 18 stranded copper conductors with braided shields.
  3. Power Cables: Minimum conductor size for power circuits shall be AWG No. 14.
- M. Fiber-optic transceivers for transmission of video signals from tail-track cameras shall be the small form-factor-pluggable (SFP) type. Fiber availability will be determined by BART Engineering.
1. Where there is sufficient fiber:
    - a. Two fibers, one for transmit and one for receive, will be allocated per transceiver.
    - b. SFP style transceivers shall be used.
    - c. LC connectors shall be used.
    - d. SFP type (SX, LX, or ZX) will be designated on all drawings and documentation.
  2. Where there is not sufficient fiber:
    - a. One fiber shall be used for both transmit and receive.
    - b. The transceivers shall meet the following characteristics:
      - 1) Compatible with 50/125 low loss multi-mode glass fiber.
      - 2) Nominal operating wavelength of 850/1300 nm.
      - 3) Range up to three miles.
      - 4) Category 6 UTP to fiber optic converters.
  3. Multimode fiber-optic cables for the tail-track cameras shall be as specified in Section 20 70 23 – Electronic Circuits, Wires, and Cables. LC type connectors with strain relief and breakout kits shall be furnished.
- N. All equipment shall be mountable in a standard 19-inch rack per EIA RS-310D.

**PART 3 - EXECUTION****3.01 INSTALLATION**

- A. Cameras shall be mounted in locations shown on the Contract drawings.
- B. Cameras accessible to the public shall be concealed or placed in protective, tamper-proof environmental enclosures and surface mounted beyond a person's normal reach plus an additional three feet.
- C. Cameras shall be located so that their FOV is not restricted by other station installations such as walls, ceilings, columns, signs, and luminaries. Plans demonstrating the unobstructed FOV of each camera shall be submitted for District review.
- D. Cameras shall be located so that they never directly view the sun. The FOV of cameras shall be adequately illuminated either by natural light or by luminaries. Within the FOV, particular care shall be taken to avoid extremes of light and shadow.
- E. Cameras and other video surveillance equipment installed in locations accessible to the public shall be mounted using tamper-proof mounting hardware.
- F. Camera video signal cables between each camera and the associated field concentrator shall be routed as shown without any splices. All cables shall be installed complying with the requirements of Contract Specification Section 20 70 26 - Common Materials and Methods for Electrical Systems, Contract Specification Section 20 70 23 - Electronic Circuits, Wires, and Cables, and Contract Specification Section 20 50 13 - Raceways for Facility Services.
- G. Power conductors for PTZ cameras shall be continuous and shall be routed in separate conduits from the Category 6 camera video cable as shown.
- H. Field concentrators and their associated power distribution and PTZ camera power supply panels shall be installed as shown.
- I. Fiber optic cables between the field concentrators and the fiber distribution cabinet in each Train Control Room (TCR) shall be installed and terminated as shown.

**3.02 TESTING**

- A. Factory and field testing shall be performed in accordance with Contract Specification Section 01 45 24 - Testing Program requirements.
- B. Factory Tests: Perform a factory test consisting of one field concentrator, one PTZ camera power supply be performed to demonstrate correct operation as defined in these Specifications.
- C. Field Tests: Complete the following:
  - 1. Perform the following camera cable tests as indicated following the approved test plan. Furnish all equipment, appliances, and labor necessary to test the installed camera cable

between the camera assembly and the field concentrator. Perform the following tests before any connections are made:

- a. Perform a continuity test on the camera cables. Camera cable shall not exhibit any discontinuities such as opens, shorts, crimps, or defects.
  - b. Perform continuity tests on the camera cables using a meter having a minimum input resistance of 20,000 ohms per volt. Show that each conductor has a resistance of not more than 16 ohms per 1000 feet of conductor run.
  - c. Measure the insulation resistance between the conductors and between each conductor, ground, and shielding using a megger meter. Perform all resistance testing after final termination and cable installation, but prior to connection of any electronics or field devices.
  - d. Replace any cable that fails to meet these parameters, or if any testing reveals defects in the cable. Retest new cable as specified above.
  - e. Furnish all test equipment.
2. Perform the following local field operations tests on site in accordance with the approved field test plan. Demonstrate the following after the camera controller assemblies, other camera hardware, field concentrators, power supplies and connecting cabling have been installed:
- a. Verify physical construction has been completed in accordance with the plans and specifications.
  - b. Inspect quality and tightness of ground and surge protector connections.
  - c. Check power supply voltages and output.
  - d. Connect devices to power source.
  - e. Verify installation of specified cables and connections between camera, pan/tilt unit, and camera control receiver.

**END OF SECTION 28 41 29**