

SECTION 28 23 00
VIDEO SURVEILLANCE

PART 1 - GENERAL

1.01 Description

- A. Provide and install a complete Video Surveillance System, which is identified as the Closed Circuit Television System hereinafter referred to as the CCTV System as specified in this section.

1.02 RELATED WORK

- A. Section 00 72 00 - General Conditions for Warranty of Construction.
- B. Section 01 00 00 - General Requirements for General Requirements.
- C. Section 07 84 00 - Firestopping for firestopping application and use.
- D. Section 26 05 11 - Requirements for Electrical Installations for connection of high voltage.
- E. Section 26 05 21 - Low-Voltage Electrical Power Conductors and Cables (600 Volts and Below) for power cables.
- F. Section 26 05 26 - Grounding and Bonding for Electrical Systems for grounding of equipment.
- G. Section 26 05 33 - Raceway and Boxes for Electrical Systems for infrastructure.
- H. Section 28 13 11 - Physical Access Control Systems (PACS) for access control.

1.03 QUALITY ASSURANCE

- A. The Contractor shall be responsible for providing, installing, and the operation of the CCTV System as shown. The Contractor shall also provide certification as required.
- B. The security system shall be installed and tested to ensure all components are fully compatible as a system and can be integrated with all associated security subsystems, whether the security system is stand-alone or a part of a complete Information Technology (IT) computer network.
- C. The Contractor or security sub-contractor shall be a licensed security Contractor as required within the state or jurisdiction of where the installation work is being conducted.

1.04 SUBMITTALS

- A. Submit below items in conjunction with Master Specification Sections 01 33 23, Shop Drawings, Product Data, and Samples, and Section 02 41 00, Demolition Drawings.
- B. Provide certificates of compliance with Section 1.3, Quality Assurance.
- C. Provide a pre-installation and as-built design package in both electronic format and on paper, minimum size 48 by 48 inches (1220 by 1220 millimeters); drawing submittals shall be per the established project schedule.
- D. Pre-installation design and as-built packages shall include, but not be limited to:
 - 1. Index Sheet that shall:
 - a. Define each page of the design package to include facility name, building name, floor, and sheet number.
 - b. Provide a list of all security abbreviations and symbols.
 - c. Reference all general notes that are utilized within the design package.
 - d. Specification and scope of work pages for all security systems that are applicable to the design package that will:
 - 1) Outline all general and job specific work required within the design package.
 - 2) Provide a device identification table outlining device Identification (ID) and use for all security systems equipment utilized in the design package.
 - 2. Drawing sheets that will be plotted on the individual floor plans or site plans shall:
 - a. Include a title block as defined above.
 - b. Define the drawings scale in both standard and metric measurements.
 - c. Provide device identification and location.
 - d. Address all signal and power conduit runs and sizes that are associated with the design of the electronic security system and other security elements (e.g., barriers, etc.).
 - e. Identify all pull box and conduit locations, sizes, and fill capacities.
 - f. Address all general and drawing specific notes for a particular drawing sheet.
 - 3. A riser drawing for each applicable security subsystem shall:
 - a. Indicate the sequence of operation.
 - b. Relationship of integrated components on one diagram.

- c. Include the number, size, identification, and maximum lengths of interconnecting wires.
 - d. Wire/cable types shall be defined by a wire and cable schedule. The schedule shall utilize a lettering system that will correspond to the wire/cable it represents (example: A = 18 AWG/1 Pair Twisted, Unshielded). This schedule shall also provide the manufacturer's name and part number for the wire/cable being installed.
- 4. A system drawing for each applicable security system shall:
 - a. Identify how all equipment within the system, from main panel to device, shall be laid out and connected.
 - b. Provide full detail of all system components wiring from point-to-point.
 - c. Identify wire types utilized for connection, interconnection with associate security subsystems.
 - d. Show device locations that correspond to the floor plans.
 - e. All general and drawing specific notes shall be included with the system drawings.
- 5. A schedule for all of the applicable security subsystems shall be included. All schedules shall provide the following information:
 - a. Device ID.
 - b. Device Location (e.g. site, building, floor, room number, location, and description).
 - c. Mounting type (e.g. flush, wall, surface, etc.).
 - d. Power supply or circuit breaker and power panel number.
 - e. In addition, for the CCTV Systems, provide the camera ID, camera type (e.g. fixed or pan/tilt/zoom (P/T/Z), lens type (e.g. for fixed cameras only) and housing model number.
- 6. Detail and elevation drawings for all devices that define how they were installed and mounted.
- E. Provide manufacturer security system product cut-sheets. Submit for approval at least 30 days prior to commencement of formal testing, a Security System Operational Test Plan. Include procedures for operational testing of each component and security subsystem, to include performance of an integrated system test.
- F. Submit manufacture's certification of Underwriters Laboratories, Inc. (UL) listing as specified. Provide all maintenance and operating manuals per the VA General Requirements, Section 01 00 00 - General Requirements.

1.05 APPLICABLE PUBLICATIONS

- A. The publications listed below (including amendments, addenda, revisions, supplement, and errata) form a part of this

specification to the extent referenced. The publications are referenced in the text by the basic designation only.

- B. American National Standards Institute (ANSI)/Electronic Industries Alliance (EIA):
 - 1. 330: Electrical Performance Standards for CCTV Cameras
 - 2. 375A: Electrical Performance Standards for CCTV Monitors
- C. Institute of Electrical and Electronics Engineers (IEEE):
 - 1. C62.41: IEEE Recommended Practice on Surge Voltages in Low-Voltage AC Power Circuits
 - 2. 802.3af: Power over Ethernet Standard
- D. National Electrical Contractors Association (NECA):
 - 1. 303-2005: Installing Closed Circuit Television (CCTV) Systems
- E. National Fire Protection Association (NFPA):
 - 1. 70-05: Article 780-National Electrical Code
- F. Federal Information Processing Standard (FIPS):
 - 1. 140-2: Security Requirements for Cryptographic Modules
- G. Underwriters Laboratories, Inc. (UL):
 - 1. 983-06: Standard for Surveillance Camera Units
 - 2. 3044-01: Standard for Surveillance Closed Circuit Television Equipment

1.06 WARRANTY OF CONSTRUCTION

- A. Warrant CCTV System work subject to the Article "Warranty of Construction" of Section 00 72 00 - General Conditions.

PART 2 - PRODUCTS

2.01 EQUIPMENT AND MATERIALS

- A. All equipment associated within the CCTV System shall be UL 3004 compliant and rated for continuous operation. Environmental conditions (i.e. temperature, humidity, wind, and seismic activity) shall be taken under consideration at each facility and site location prior to installation of the equipment.
- B. All equipment shall operate on a 120 or 240 volts alternating current (VAC); 50 Hz or 60 Hz AC power system unless documented otherwise in subsequent sections listed within this specification. All equipment shall have a back-up source of power

that will provide a minimum of 96 hours of run time in the event of a loss of primary power to the facility.

- C. The system shall be designed, installed and programmed in a manner that will allow for ease of operation, programming, servicing, maintenance, testing, and upgrading of the system.
- D. All CCTV System components located in designated "HAZARDOUS ENVIRONMENT" areas where fire or explosion could occur due to the presence of natural gases or vapors, flammable liquids, combustible residue, or ignitable fibers or debris, shall be rated Class II, Division I, Group F, and installed in accordance with NFPA 70, Chapter 5.
- E. All equipment and materials for the system will be compatible to ensure correct operation.

2.02 EQUIPMENT ITEMS

- A. CCTV system shall meet following requirements:
- B. All Cameras will be EIA 330 and UL 983 compliant as well as:
 - 1. Will be charge coupled device (CCD) cameras and shall conform to National Television System Committee (NTSC) formatting.
 - 2. Fixed cameras shall be color and the primary choice for monitoring following the activities described below.
 - 3. Shall be powered by either 12 volts direct current (VDC) or 24 VAC. Power supplies shall be Class 2 and UL compliant and have a back-up power source to ensure cameras are still operational in the event of loss of primary power to the CCTV System.
 - 4. Shall be rated for continuous operation under the following environmental conditions:
 - a. Ambient temperatures of minus 10 degrees C (14 degrees F) to 55 degrees C (131 degrees F) utilizing equipment that will provide automatic heating and cooling.
 - b. Humidity, wind gusts, ice loading, and seismic conditions specified or encountered for locations where CCTV cameras will be utilized.
 - 5. Will be home run to a monitoring and recording device via a controlling device such as a matrix switcher or network server and monitored on a 24 hour basis at a designated Access Control System and Database Management location.
 - 6. Each function and activity shall be addressed within the system by a unique twenty (20) character user defined name. The use of codes or mnemonics identifying the CCTV action shall not be accepted.

7. Shall come with built-in video motion detection that shall automatically monitor and process information from each camera. The camera motion detection shall detect motion within the camera's field of view and provide automatic visual, remote alarms, and motion-artifacts as a result of detected motion as follows:
 - a. Motion-detection settings shall include adjustable object size and velocity, as well as a selectable detection area of 132 zones in a twelve (12) x eleven (11) grid.
 - b. Sensors shall accept video signals from CCTV cameras and when synchronizing is required, it shall be in composite synchronization.
 - c. Sensor processors shall detect motion by digitizing multiple pixels within each video scene and by comparing the gray scale of the pixels to a previously stored reference. The number of pixels digitized depends on the application. The designer of the system shall consider cost effectiveness as a factor since digitizing a large number of pixels could increase cost dramatically with little additional actual detection capability for a specific application.
 - d. An alarm shall be initiated when the comparison varies by six (6) percent or more.
8. Appropriate signage shall be designed, provided, and posted that notifies people that an area is under camera surveillance.
9. Dummy or fake cameras will not be utilized at any time.
10. Shall be programmed to digitally flip from color to black and white at dusk and vice versa at dawn.
11. Will be fitted with auto-iris lenses to ensure the image is maintained in low light.
12. Lightning protection shall be IEEE C62.41 compliant and provided for all cameras. Either surge protectors or a lightning grid may be utilized. Ensure all lightning protection equipment is compliant with Article 780 of the National Electrical Code (NEC). The use of Fuses and Circuit Breakers as a means of lightning protection shall not be allowed.
13. If using the camera as part of a CCTV network a video encoder shall be used to convert the signal from National Television System(s) Committee (NTSC) to Moving Picture Experts Group (MPEG) format.
14. Fixed Color Cameras Technical Characteristics:

Imaging Device	1/3-inch interline transfer CCD
Picture Elements	NTSC 510 (H) x 492 (V)
Scanning System	NTSC 525 lines, 21 interlace

Synchronization System	AC line lock/internal
Horizontal Resolution	330 TV lines
Iris Control	Selectable on/off
Electronic Shutter Range	NTSC 1/60-1/100,000 second
Auto Iris Lens Type	DC/video drive (auto sensing)
Minimum Illumination	0.6 lux
Signal to Noise Ratio	>50 dB
Automatic Gain Control	On/off switchable
Backlight Compensation	On/off switchable
Auto White Balance	On/off switchable
Video Output	1 Vp-p, 75 ohms
Power Consumption	Less than 5 watts
Video Connector	BNC
Lens Mount	C/CS mount (adjustable)

- C. Lenses: Shall be utilized in a manner that provides maximum coverage of the area being monitored by the camera. The lenses shall:
1. Be 1/3 inch to fit CCD fixed camera.
 2. Be all glass with coated optics.
 3. Have mounts that are compatible with the camera selected.
 4. Be packaged and supplied with the camera.
 5. Have a maximum f-stop of f/1.3 for fixed lenses, and a maximum f-stop of f/1.6 for variable focus lenses.
 6. Be equipped with an auto-iris mechanism.
 7. Have sufficient circle of illumination to cover the image sensor evenly.
 8. Not be used on a camera with an image format larger than the lens is designed to cover.
 9. Be provided with pre-set capability.
- D. Two types of lenses shall be utilized for both interior and exterior fixed cameras:
1. Manual Variable Focus
 2. Auto Iris Fixed
- E. Manual Variable Focus:
1. Shall be utilized in large areas that are being monitored by the camera. Examples of this are perimeter fence lines, vehicle entry points, parking areas, etc.
 2. Shall allow for setting virtually any angle of field, which maximizes surveillance effects.

3. Technical Characteristics:

Image format	1/3 inch
Focal length	5-50mm
Iris range	F1.4 to close
Focus range	1m (3.3 ft)
Back focus distance	10.05 mm (0.4 in)
Angle view Wide (1/3 in)	53.4 x 40.1
Angle view Tele (1/3 in)	5.3 x 4.1
Iris control	manual
Focus ctrl	manual
Zoom ctrl	manual

F. Video Display Equipment

1. Will consist of color monitors and shall be EIA 375A compliant.
2. Shall be able to display analog, digital, and other images in either NTSC or MPEG format associated with the operation of the Security Management System (SMS).
3. Shall:
 - a. Have front panel controls that provide for power on/off, horizontal and vertical hold, brightness, and contrast.
 - b. Accept multiple inputs, either directly or indirectly.
 - c. Have the capabilities to observe and program the CCTV System.
 - d. Be installed in a manner that they cannot be witnessed by the general public.

4. Color Video Monitors Technical Characteristics:

Sync Format	PAL/NTSC
Display Tube	90° deflection angle
Horizontal Resolution	250 TVL minimum, 300 TVL typical
Video Input	1.0 Vp-p, 75 Ohm
Front Panel Controls	Volume, Contrast, Brightness, Color
Connectors	BNC

H. Camera Housings and Mounts:

1. This section pertains to all interior and exterior housings, domes, and applicable wall, ceiling, corner, pole and rooftop mounts associated with the housing. Housings and mounts shall be specified in accordance to the type of cameras used.
2. All cameras and lenses shall be enclosed in a tamper resistant housing. Any additional mounting hardware

required to install the camera housing at its specified location shall be provided along with the housing.

3. The camera and lens contained inside the housing shall be installed on a camera mount. All additional mounting hardware required to install the camera housing at its specified location shall be provided along with the housing.
4. Shall be manufactured in a manner that are capable of supporting a maximum of three (3) cameras with housings, and meet environmental requirements for the geographical area the camera support equipment is being installed on or within.
5. Environmentally Sealed
 - a. Shall:
 - 1) Be designed in manner that it provides a condensation free environment for correct camera operation.
 - 2) Operate in a 100 percent condensing humidity atmosphere.
 - 3) Be constructed in a manner that:
 - a) Has a fill valve to allow for the introduction of nitrogen into the housing to eliminate existing atmospheric air and pressurize the housing to create moisture free conditions.
 - b) Has an overpressure valve to prevent damage to the housing in the event of over pressurization.
 - c) Is equipped with a humidity indicator that is visible to the eye to ensure correct atmospheric conditions at all times.
 - d) The leak rate of the housing is not to be greater than 13.8kPa or 2 pounds per square inch at sea level within a 90 day period.
 - e) It shall contain camera mounts or supports as needed to allow for correct positioning of the camera and lens.
 - f) The housing and sunshield are to be white in color.
 - b. All electrical and signal cables required for correct operations shall be supplied in a hardened carrier system from the controller to the camera.
 - c. The mounting bracket shall be adjustable to allow for the housing weight of the camera and the housing unit it is placed in.
 - d. Accessibility to the camera and mounts shall be taken into consideration for maintenance and service purposes.

6. Exterior Wall Mounts

- a. Shall have an adjustable head for mounting the camera.
- b. Shall be constructed of aluminum, stainless steel, or steel with a corrosion-resistant finish.
- c. The head shall be adjustable for not less than plus and minus 90 degrees of pan, and not less than plus and minus 45 degrees of tilt. If the bracket is to be used in conjunction with a pan/tilt, the bracket shall be supplied without the adjustable mounting head, and shall have a bolt-hole pattern to match the pan/tilt base.
- d. Shall be installed at a height that allows for maximum coverage of the area being monitored.

I. Controlling Equipment

- 1. Shall be utilized to call up, operate and program all cameras associated CCTV System components.
- 2. Will have the ability to operate the cameras locally and remotely. A matrix switcher or a network server shall be utilized as the CCTV System controller.
- 3. The controller shall be able to fit into a standard 19" (47.5 cm) equipment rack.
- 4. Control and programming keyboards shall be provided with its own type of switcher. All keyboards shall:
 - a. Be located at each monitoring station.
 - b. Be addressable for programming purposes.
 - c. Provide interface between the operator and the CCTV System.
 - d. Provide full control and programming of the switcher.
 - e. Have the minimum following controls:
 - 1) programming
 - 2) switching
 - 3) lens function
 - 4) environmental housing
 - 5) annotation
- 5. Matrix Switcher: The matrix switcher shall meet the following minimum requirements:
 - a. Take multiple camera inputs and route them to multiple monitoring stations.
 - b. Allow for centralized user management controlling configurations.
 - c. Provide live viewing of all cameras.
 - d. Provide P/T/Z, focus, and iris control of all unitized cameras.
 - e. Be expandable to allow for the addition of multiple cameras and monitoring stations over the life of the

system visual identification system by utilizing input and output video and controller cards.

- f. Input cards shall allow for the addition of a minimum of four (4) camera inputs per card.
- g. Output cards shall allow for the addition of a minimum of eight (8) outputs per card.
- h. Have the ability to be programmed either locally or remotely.
- i. Remotely operate multiple cameras from multiple stations.
- j. Be able to fully interface with a digital video recorder (DVR) for recording of all events.
- k. Utilize RS-232 or fiber optic connections for integration with the SMS computer station via a remote port on a network hub.
- l. Shall have an alarm interface that is compatible with all associated security subsystems. Alarm inputs shall be via either a relay or an EIA ANSI/EIA/TIA-232-F interface. The interface shall allow for a minimum of 24 alarm inputs and 12 alarm outputs.
- m. The switcher response time to an alarm input shall not be less than 200 milliseconds from the time an alarm is sensed until a picture is displayed on a monitor.
- n. The switcher shall have a built in buffer to allow for back-log of alarms. These alarms shall be viewable by an operator.
- o. Be addressable in the event multiple matrix switchers are connected to the SMS.
- p. Be configured, i.e. camera names, monitor names, sequences, alarms and alarm actions, etc. utilizing the configuration program and tools provided by the matrix manufacturer.
- q. The matrix switcher shall meet the following minimum input/output requirements:

Camera inputs	16
Video outputs	4
Keyboard/Controller Outputs	4
Alarm inputs	323

- r. The matrix switcher will have the following components and technical characteristics:

1) Main Unit:

Functions	Monitor control Camera selection, tour sequence, group sequence, group preset, OSD display, Camera/Receiver control via coaxial or RS-485 cable communication, Recorder control
Alarm control	Alarm Event, Alarm Acknowledge, Alarm Reset, Alarm Suspension, Alarm History Display, Timer Event and Camera Event
RS-485 (Camera)Port	6-conductor modular jack x 12 (2- wire or 4-wire comM, With termination switches (MODE 1

	to 4))
Extension Port	6-conductor modular jack x 2 (With a (EXTENSION 1 IN, OUT) termination switch (TERM: ON, OFF))
Extension Port	37-pin D-sub connector x 2 (EXTENSION IN 2 or 3)
Extension Port	37-pin D-sub connector x 2 (EXTENSION OUT 2 or 3)

2) Input Board:

Camera Input	1 V [P-P]/75 Ohm (BNC), composite video signal 0.5 V [P- P]/75 Ohm data signal and 2.5 V [P- P]/75 Ohm (25 pin D sub connector x 4)
Alarm Input	N.O. (Normally Open contact) or N.C. (Normally Close contact) selectable x 32 (37 pin D sub connector)

3) Output Board:

Monitor Output	1 V [P-P]/75 Ohm (BNC)
Alarm Output	Open collector output x 32, Max. 24 VDC, 100 mA
Extension Port	6-conductor modular jack x 2
Serial Port	9-pin D-sub connector x 2

6. Network Server

- a. Allow for the transmission of live video, data, and audio over either an existing Ethernet network or a dedicated security system network, requiring an IP address or Internet Explorer 5.5 or higher, or shall work as an analog-to-Ethernet "bridge" controlling matrices, multiplexers, and pan/tilt/zoom cameras. The network shall operate in a box-to-box configuration allowing for encoded video to be decoded and displayed on an analog monitor.
- b. If a CCTV System network is going to be utilized as the primary means of monitoring, operating, and recording cameras then the following equipment shall be required as part of the system:
 - 1) System Server
 - 2) Computer Workstation
 - 3) Recording Device
 - 4) Encoder/Decoder
 - 5) Monitor
 - 6) Hub/Switch
 - 7) Router
 - 8) Encryptor
- c. Shall provide overall control, programming, monitoring, and recording of all cameras and associated devices within the CCTV System.

- d. All equipment on the network shall be IP addressable.
- e. The CCTV System network shall meet or exceed the following design and performance specifications:
 - 1) Two MPEG-4 video streams for a total of 40 images per second will be provided.
 - 2) PC Software that manages the installation and maintenance of all hardware transmitters and receivers on the network shall be provided.
 - 3) Video Source that supports any NTSC video source to the computer network shall be addressed.
 - 4) Receivers that could be used to display the video on a standard analog NTSC or PAL monitor will be addressed.
- f. The system shall support the following network protocols:
 - 1) Internet connections: RTP, Real Time Control Protocol (RTCP), UDP, IP, TCP, ICMP, HTTP, Simple Network Management Protocol (SNMP), IGMP, DHCP and ARP.
 - 2) Video Display: MPEG-4, M-JPEG in server push mode only.
 - 3) Have the ability to adjust bandwidth, image quality and image rate.
 - 4) Support image sizes of either 704 x 576 pixels or 352 x 288 pixels.
 - 5) Have an audio coding format of G.711 or G.728.
 - 6) Provide a video frame rate of at least 30 images per second.
 - 7) Support LAN Interface Ethernet 10/100BaseT and be auto sensing.
 - 8) Have a LAN Data Rate of 9.6 Kbps to 5.0 Mbps.
 - 9) Utilize data interface RS-232/RS-422/RS-485.
- g. All connections within the system shall be via CAT-V cable and RJ-45 jacks. If analog equipment is used as part of the system, then either an encoder or a decoder will be utilized to convert the analog signal to a digital one.
- h. The CCTV network system shall conform to all VA agency wide security standards for administrator and operator use.
- i. Server Technical Characteristics:

Hardware	Personal Computer
CPU	Pentium IV, 3.0 GHz or better
Hard Disk Interface	IDE or better
RAM	256 MB
OS	Windows XP Home/XP Professional
Graphic Card	NVIDIA GeForce 6600 NVIDIA Quadro FX1400 ATI RADEON X600/X800 or better
Ethernet Card	100 Mb
Software	DirectX 9.0c

Free Memory	120 MB
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j. Network Switch Technical Characteristics:

Protocol standard	and IEEE802.3 IEEE802.3u IEEE802.3ab
Ports	24 10/100/1000M auto-negotiation RJ-45 ports with auto MDI/MDI-X
Network media	Cat 5 UTP for 1,000Mbps Cat 3 UTP for 10Mbps
Transmission method	store-and-forward
LED	indicator power, act/link, speed

k. Router Technical Characteristics:

Network Standards	IEEE 802.3, 802.3u10Base-T Ethernet (WAN) 100Base-T Ethernet (LAN) IEEE 802.3x Flow Control IEEE802.1p Priority Queue ANS/IEEE 802.3 NWay auto-negotiation
Protocol	CSMA/CD, TCP, IP, UDP, PPPoE AND DHCP (client and server)
VPN Supported	PPTP, IPsec pass-through
Management	Browser
Ports	4 x 10/100Base-T Auto sensingRJ45 ports, and an auto uplink RJ45port(s) 1 x 10Base-T RJ45 port, WAN
LEDs	Power, WAN Activity, LAN Link (10/100), LAN Activity

l. Encryptor Technical Characteristics:

Cryptography	Standard - Triple DES 168-bit (ANSI 9.52) Rijndael - AES (128, 192, 256)
Performance	Throughput (end-to-end) @ 100 Mbps line speed: >188 Mbps full duplex (large frames) >200 kfps full duplex (small frames) Latency (end-to-end) @ 100 Mbps
Key Management	Automatic KEK/DEK Exchange Using Signed Diffie-Hellman Unit Authentication Using X.509 Certificates
Physical Interfaces	10BaseT or 10/100BaseT Ethernet (Host and Network Ports) 10BaseT Ethernet Management Port Back and Front-Panel Serial Control Port
Device Management	THALES Element Manager, Front Panel Viewer, and Certificate Manager 10Base T (RJ-45) or 9-pin Serial Control Port SNMP Network Monitoring
Security Features	Tamper Proof Cryptographic Envelope Tamper Evident Chassis Hardware Random Number Generator
Management	Channel Encrypted Using Same Algorithm as Data Traffic
Security Certifications	FIPS 140-2 Level 3 CAPS Baseline and Enhanced Grades Common Criteria EAL4 and EAL5 (under evaluation)

Regulatory	EN60950, FCC, UL, CE, EN 50082-1, and EN 55022
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J. Recording Devices

1. All cameras on the CCTV System shall be recorded in real time using a Digital Video Recorder (DVR), Network Video Recorder (NVR), or a Time Lapse Video Recorder (VCR). The type of recording device utilized should be determined by the size and type of CCTV System designed and installed, and to what extent the system is to be utilized.
2. All recording devices shall be 19" (47.5 cm) rack-mountable.
3. All DVRs and NVRs that are viewable over an Intranet or Internet will be routed through an encryptor. Encryptors shall:
 - a. Comply with FIPS PUB 140-2.
 - b. Support TCP/IP.
 - c. Directly interfaces to low-cost commercial routers.
 - d. Provide packet-based crypto synchronization.
 - e. Encrypt source and destination IP addresses.
 - f. Support web browser based management requiring no additional software.
 - g. Have a high data sustained throughput – 1.544 Mbps (T1) full duplex data rate.
 - h. Provide for both bridging and routing network architecture support.
 - i. Support Electronic Key Management System (EKMS) compatible.
 - j. Have remote management ability.
 - k. Automatically reconfigure when secure network or wide area network changes.
4. Digital Video Recorder (DVR):
 - a. Shall record video to a hard drive-based digital storage medium in either NTSC or MPEG format.
 - b. Shall meet the following minimum requirements:
 - 1) Record at minimum rate of 30 images per second (IPS).
 - 2) Have a minimum of eight (8) to 16 looping inputs.
 - 3) Have a minimum of eight (8) to 16 alarm inputs and two (2) relay outputs.
 - 4) Shall provide instantaneous playback of all recorded images.
 - 5) Be IP addressable, if part of a CCTV network.
 - 6) Have built-in digital motion detection with masking and sensitivity adjustments.
 - 7) Provide easy playback and forward/reverse search capabilities.
 - 8) Complete audit trail database, with minimum of a six-month history that tracks all events

- related to the alarm; specifically who, what, where and when.
- 9) DVR management capability providing automatic video routing to a back-up spare recorder in case of failure.
 - 10) Accessible locally and remotely via the Internet, Intranet, or a personal digital assistant (PDA).
 - 11) Records all alarm events in real time, ensuring 60 seconds before and after the event are included in the recording.
 - 12) Utilize RS-232 or fiber optic connections for integration with the SMS computer station via a remote port on a network hub.
 - 13) Allow for independently adjustable frame rate settings.
 - 14) Be compatible with the matrix switcher utilized to operate the cameras. The DVR could be utilized as a matrix switcher only if it meets all of the requirements listed in the matrix switcher section.

c. Technical Characteristics:

Processor	Intel Pentium III 750 MHz
Memory	256 MB RAM
Operating System	Windows 98, NT, ME, 2000, and XP
Video Card	4 MB of RAM capable of 24-bit true color display
Free Hard Disk Space	160 MB for software installation
Network Card	10Base-T network for LAN operation
Archiving	80 GB, 160 GB, 320 GB and 640 GB Hard Drive; CD-RW
Video Input	1.0 Vpp (signal 714mV, sync 286mV) 75 ohms (BNC unbalanced)
Video Output Level	1.0 Vpp +/-10%, 75 ohms (BNC unbalanced)
Impedance	75 ohms/Hi-impedance x 16 switchable
Network Interface	Ethernet (RJ-45, 10/100M)
Network Protocol	TCP/IP, DHCP, HTTP, UDP
Network Capabilities	Live/Playback/P/T/Z control
Recording Rate	30 ips for 720 x 240 (NTSC)
Password Protection	Menu Setup, Remote Access
Recording Capacity	160 (1 or 2 fixed HDD) 1 CD-RW
Power Interrupt	Auto recovered to recording mode

5. Network Video Recorder (NVR)

- a. Shall record video to a hard drive-based digital storage medium in MPEG format.
- b. Shall meet the following minimum requirements:
 - 1) Record at minimum rate of 30 IPS.

- 2) Have a minimum of eight (8) to 16 looping inputs.
- 3) Have a minimum of eight (8) to 16 alarm inputs and two (2) relay outputs.
- 4) Shall provide instantaneous playback of all recorded images.
- 5) Be IP addressable, if part of a CCTV network.
- 6) Have built-in digital motion detection with masking and sensitivity adjustments.
- 7) Easy playback and forward/reverse search capabilities.
- 8) Complete audit trail database, with minimum of a six-month history that tracks all events related to the alarm; specifically who, what, where and when.
- 9) NVR management capability providing automatic video routing to a back-up spare recorder in case of failure.
- 10) Accessible locally and remotely via the internet, intranet, or a personal digital assistant (PDA).
- 11) Records all alarm events in real time, ensuring 60 seconds before and after the event are included in the recording.
- 12) Utilize RS-232 or fiber optic connections for integration with the SMS computer station via a remote port on a network hub.
- 13) Allow for independently adjustable frame rate settings.
- 14) Be compatible with the matrix switcher utilized to operate the cameras.

c. Technical Characteristics:

Hardware/CPU	Pentium III Xeon or IV, 1.8 GHz
HDD Interface	IDE or better; optional: SCSI II, SCSI Ultra, or Fiber Channel
RAM	1024 MB
Operating System	Windows 2000/XP Professional/Server 2003 Standard
Graphic	Card VGA
Ethernet Card	100/1000 MB
Memory	20 MB
Software Setup	Centralized setup from each authorized PC; access via VIDOS or integrated web server
Storage Media	All storage media possible (e.g., HD, RAID), depending on operating system
Storage Mode	Linear mode, ring mode (capacity-based)
Recording Configuration	Camera name assignment, bandwidth limit, frame rate, video quality
Recording Content	Video and/or audio data
Search Parameters	Time, date, event
Playback	Playback via VIDOS over any IP network (LAN/WAN) simultaneous recording, playback, and backup
Network Interface	Ethernet (RJ-45, 10/100M)

Network Protocol	TCP/IP, DHCP, HTTP, UDP
Network Capabilities	Live/Playback/P/T/Z control
Recording Rate	30 ips for 720 x 240 (NTSC)
Password Protection	Menu Setup, Remote Access
Recording Capacity	160 (1 or 2 fixed HDD) 1 CD-RW
Power Interrupt	Auto recovered to recording mode

6. Time Lapse Video Recorder (VCR)

a. Shall be specifically designed as a time lapse recorder within the CCTV System and shall meet the following minimum requirements:

- 1) Allow for repeat recording.
- 2) Allow for series recording with multiple recorders.
- 3) Be able to record Daily/Weekly/Holiday schedules.
- 4) Jog/Shuttle for easy forward or reverse field playback.
- 5) Search using alarm index, time and date, skip, counter memory stop.
- 6) Have a built in time and date generator that can be turned on and off, and shall impose the time and date on the video during recording.
- 7) Have a built in alarm that shall annunciate the end of tape, excessive condensation, transport malfunction, or tape jam.
- 8) Have on-screen programming.
- 9) Interface with the matrix switcher.
- 10) Have automatic head cleaning.
- 11) Have battery backup for internal settings.
- 12) Have a tape use counter.
- 13) Have a daylight saving time setting.

b. Video tape used in the recorder shall:

- 1) Be contained in a cassette mechanism.
- 2) Be self loading and not require the operator the thread the tape.
- 3) Load through the front of the recorder.
- 4) Be labeled with the date and times of coverage.
- 5) Stored for a period not less than that specified in the VA CCTV standards.

c. Shall be locally installed at the monitoring station.

d. Technical Characteristics:

Tape Format	Standard 1/2 inch VHS
Video Recording Standard	6/8 Hour in NTSC
Time Lapse Recording	18/30/54/78/102/126/174 or 24/40/72/104/136/160/232 hour
Video Recording System	Rotary 2-head azimuth
Video Head Configuration	4-head double azimuth Tape Transport
Rewind/FF Speed	Within 120 seconds (with T-120 VHS)

	tape)
Head Cleaning	Automatic
Record/Playback	Time Mode (EP) 6H, L18H, L30H, 48H, 72H, 96H, 0H
Horizontal Resolution	(SR Mode) 400 lines (VHS Mode) 240 lines
Video Input/Output	(BNC) 1.0 Vp-p, 75 Ohm
Audio System Record/Playback	6H, L18H, L30H
Timer Recording	8 event programmability
Display	Month/Day/Year and Time

K. Wires and Cables

1. Shall meet or exceed the manufactures recommendation for power and signal.
2. Will be carried in an enclosed conduit system, utilizing electromagnetic tubing (EMT) to include the equivalent in flexible metal, rigid galvanized steel (RGS) to include the equivalent of liquid tight, polyvinylchloride (PVC) schedule 40 or 80.
3. All conduits will be sized and installed per the NEC. All security system signal and power cables that traverse or originate in a high security office space will contained in either EMT or RGS conduit.
4. All conduit, pull boxes, and junction boxes shall be clearly marked with colored permanent tape or paint that will allow it to be distinguished from all other conduit and infrastructure.
5. Conduit fills shall not exceed 50 percent unless otherwise documented.
6. A pull string shall be pulled along and provided with signal and power cables to assist in future installations.
7. At all locations where there is a wall penetration or core drilling is conducted to allow for conduit to be installed, fire stopping materials shall be applied to that area
8. High voltage and signal cables shall not share the same conduit and shall be kept separate up to the point of connection. High voltage for the security system shall be defined as any cable or sets of cables carrying 30 VDC/VAC or higher.
9. For all equipment that is carrying digital data between the Access Control System and Database Management or at a remote monitoring station, shall not be less that 20 AWG and stranded copper wire for each conductor. The cable or each individual conductor within the cable shall have a shield that provides 100 percent coverage. Cables with a single overall shield shall have a tinned copper shield drain wire.

10. All cables and conductors, except fiber optic cables, that act as a control, communication, or signal lines shall include surge protection. Surge protection shall be furnished at the equipment end and additional triple electrode gas surge protectors rated for the application on each wire line circuit shall be installed within three (3) ft. (one (1) m.) of the building cable entrance. The inputs and outputs shall be tested in both normal and common mode using the following wave forms:
 - a. A 10 microsecond rise time by 1000 microsecond pulse width waveform with a peak voltage of 1500 volts and peak current of 60 amperes.
 - b. An 8 microsecond rise time by 20 microsecond pulse width wave form with a peak voltage of 1000 volts and peak current of 500 amperes.
11. The surge suppression device shall not attenuate or reduce the video or sync signal under normal conditions. Fuses and relays shall not be used as a means of surge protection.
12. Coaxial Cables
 - a. All video signal cables for the CCTV System, with exception to the PoE cameras, shall be a coaxial cable and have a characteristic impedance of 75 ohms plus or minus 3 ohms.
 - b. For runs up to 750 feet use of an RG-59/U is required. The RG-59/U shall be shielded which provides a minimum of 95 percent coverage, with a stranded copper center conductor of a minimum 23 AWG, polyethylene insulation, and black non-conductive polyvinylchloride (PVC) jacket.
 - c. RG-59/U Technical Characteristics:

AWG	22
Stranding	7x29
Conductor Diameter	.031 in.
Conductor Material	BCC
Insulation Material	Gas-injected FHDPE
Insulation Diameter	.145 in.
Outer Shield Type	Braid/Braid
Outer Jacket Material	PVC
Overall Nominal Diameter	.242 in.
UL Temperature Rating	75°C
Nom. Characteristic Impedance	75 Ohms
Nom. Inductance	0.094 µH/ft
Nom. Capacitance	Conductor to Shield 17.0 pF/ft
Nom. Velocity of Propagation	80 %
Nom. Delay	1.3 ns/ft
Nom. Conductor DC Resistance @ 20°C	12.2 Ohms/1000 ft
Nom. Outer Shield DC Resistance @ 20°C	2.4 Ohms/1000 ft
Max. Operating Voltage	UL 300 V RMS

13. Signal Cables:

- a. Signal wiring for PoE cameras depends on the distance the camera is being installed from either a hub or the server.
- b. If the camera is up to 300 ft from a hub or the server, then use a shielded UTP category 5 (CAT-V) cable with standard RJ-45 connector at each end. The cable must comply with the Power over Ethernet, IEEE802.3af, Standard.
- c. If the camera is over 300 ft from a hub or server then utilize a multimode fiber optic cable with a minimum size of 62 microns.
- d. Provide a separate cable for power.
- e. CAT-5 Technical Characteristics:

Number of Pairs	4
Total Number of Conductors	8
AWG	24
Stranding	Solid
Conductor Material	BC - Bare Copper
Insulation Material	PO - Polyolefin
Overall Nominal Diameter	.230 in.
IEC Specification	11801 Category 5
TIA/EIA Specification	568-B.2 Category 5e
Max. Capacitance Unbalance	(pF/100 m) 150 pF/100 m
Nom. Velocity of Propagation	70 %
Max. Delay	(ns/100 m) 538 @ 100MHz
Max. Delay Skew	(ns/100m) 45 ns/100 m
Max. Conductor DC Resistance	9.38 Ohms/100
Max. DCR Unbalance @ 20°C	3 %
Max. Operating Voltage	UL 300 V RMS

f. Fiber Optic Cables Technical Characteristics:

Fiber Type	62.5 Micron
Number of Fibers	4
Core Diameter	2.5 +/- 2.5 microns
Core Non-Circularity	5% Maximum
Clad Diameter	125 +/- 2 microns
Clad Non-Circularity	1% Maximum
Core-clad Offset	1.5 Microns Maximum
Primary Coating Material	Acrylate
Primary Coating Diameter	245 +/- 10 microns
Secondary Coating Material	Engineering Thermoplastic
Secondary Coating Diameter	900 +/- 50 microns
Strength Member Material	Aramid Yarn
Outer Jacket Material	PVC
Outer Jacket Color	Orange
Overall Diameter	.200 in.
Numerical Aperture	.275
Maximum Gigabit Ethernet	300 meters
Maximum Gigabit Ethernet	550 meters

14. Power Cables:

- a. Will be sized accordingly and shall comply with the NEC. High voltage power cables will be a minimum of three conductors, 14 AWG, stranded, and coated with a non-conductive polyvinylchloride (PVC) jacket. Low voltage cables will be a minimum of 18 AWG, stranded and non-conductive polyvinylchloride (PVC) jacket.
- b. Will be utilized for all components of the CCTV System that require either a 110 VAC 60 Hz or 220 VAC 50 Hz input. Each feed will be connected to a dedicated circuit breaker at a power panel that is primarily for the security system.
- c. All equipment connected to AC power shall be protected from surges. Equipment protection shall withstand surge test waveforms described in IEEE C62.41. Fuses shall not be used as a means of surge protection.
- d. Shall be rated for either 110 or 220 VAC, 50 or 60 Hz, and shall comply with VA Master Spec 26 05 21 Low Voltage Electrical Power Conductors and Cables (600 Volts and Below).
- e. Low Voltage Power Cables
 - 1) Shall be a minimum of 18 AWG, Stranded and have a polyvinylchloride outer jacket.
 - 2) Cable size shall determined using a basic voltage over distance calculation and shall comply with the NEC's requirements for low voltage cables.

2.03 INSTALLATION KIT

A. General:

1. The kit shall be provided that, at a minimum, includes all connectors and terminals, labeling systems, audio spade lugs, barrier strips, punch blocks or wire wrap terminals, heat shrink tubing, cable ties, solder, hangers, clamps, bolts, conduit, cable duct, and/or cable tray, etc., required to accomplish a neat and secure installation. All wires shall terminate in a spade lug and barrier strip, wire wrap terminal or punch block. Unfinished or unlabeled wire connections shall not be allowed. All unused and partially opened installation kit boxes, coaxial, fiber-optic, and twisted pair cable reels, conduit, cable tray, and/or cable duct bundles, wire rolls, physical installation hardware shall be turned over to the Contracting Officer. The following sections outline the minimum required installation sub-kits to be used:
2. System Grounding:
 - a. The grounding kit shall include all cable and installation hardware required. All head end equipment and power supplies shall be connected to earth ground via internal building wiring, according to the NEC.
 - b. This includes, but is not limited to:
 - 1) Coaxial Cable Shields
 - 2) Control Cable Shields
 - 3) Data Cable Shields
 - 4) Equipment Racks
 - 5) Equipment Cabinets
 - 6) Conduits
 - 7) Cable Duct blocks
 - 8) Cable Trays
 - 9) Power Panels
 - 10) Grounding
 - 11) Connector Panels
3. Coaxial Cable: The coaxial cable kit shall include all coaxial connectors, cable tying straps, heat shrink tabbing, hangers, clamps, etc., required to accomplish a neat and secure installation.
4. Wire and Cable: The wire and cable kit shall include all connectors and terminals, audio spade lugs, barrier straps, punch blocks, wire wrap strips, heat shrink tubing, tie wraps, solder, hangers, clamps, labels etc., required to accomplish a neat and orderly installation.
5. Conduit, Cable Duct and Cable Tray: The kit shall include all conduit, duct, trays, junction boxes, back boxes, cover plates, feed through nipples, hangers, clamps, other hardware required to accomplish a neat and secure conduit, cable duct, and/or cable tray installation in accordance with the NEC and this document.

6. Equipment Interface: The equipment kit shall include any item or quantity of equipment, cable, mounting hardware and materials needed to interface the systems with the identified sub-system(s) according to the OEM requirements and this document.
7. Labels: The labeling kit shall include any item or quantity of labels, tools, stencils, and materials needed to correctly label each subsystem according to the OEM requirements, as-installed drawings, and this document.
8. Documentation: The documentation kit shall include any item or quantity of items, computer discs, as installed drawings, equipment, maintenance, and operation manuals, and OEM materials needed to correctly provide the system documentation as required by this document and explained herein.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. System installation shall be in accordance with NECA 303, manufacturer and related documents and references, for each type of security subsystem designed, engineered and installed.
- B. Components shall be configured with appropriate "service points" to pinpoint system trouble in less than 30 minutes.
- C. The Contractor shall install all system components including Government furnished equipment, and appurtenances in accordance with the manufacturer's instructions, documentation listed in Sections 1.4 and 1.5 of this document, and shall furnish all necessary connectors, terminators, interconnections, services, and adjustments required for a complete and operable system.
- D. The CCTV System will be designed, engineered, installed, and tested to ensure all components are fully compatible as a system and can be integrated with all associated security subsystems, whether the system is a stand alone or a complete network.
- E. For integration purposes, the CCTV System shall be integrated where appropriate with the following associated security subsystems:
 1. PACS:
 - a. Provide 24 hour coverage of all entry points to the perimeter and agency buildings. As well as all emergency exits utilizing a fixed color camera.
 - b. Record cameras on a 24 hours basis.
 - c. Be programmed go into an alarm state when an emergency exit is opened, and notify the Access Control System and Database Management of an alarm event.

- d. For additional CCTV System requirements as they relate to the PACS, refer to Section 28 13 11 - Physical Access Control Systems.
- 2. IDS:
 - a. Provide a recorded alarm event via a color camera that is connected to the IDS system by either direct hardwire or a security system computer network.
 - b. Record cameras on a 24 hours basis.
 - c. Be programmed to go into an alarm state when an IDS device is put into an alarm state.
 - d. For additional CCTV System requirements as they relate to the IDS, refer to Master Specification 28 16 11.
- 3. Security Access Detection:
 - a. Provide full coverage of all vehicle and lobby entrance screening areas utilizing a fixed color camera.
 - b. Record cameras on a 24 hours basis.
 - c. The CCTV System should have facial recognition software to assist in identifying individuals for current and future purposes.
 - d. For additional CCTV System requirements as they relate to the Security Access Detection, refer to Master Specification 28 13 53.
- F. Integration with these security subsystems shall be achieved by computer programming or the direct hardwiring of the systems.
- G. For programming purposes refer to the manufacturers requirements for correct system operations. Ensure computers being utilized for system integration meet or exceed the minimum system requirements outlined on the systems software packages.
- H. A complete CCTV System shall be comprised of, but not limited to, the following components:
 - 1. Cameras
 - 2. Lenses
 - 3. Video Display Equipment
 - 4. Camera Housings and Mounts
 - 5. Controlling Equipment
 - 6. Recording Devices
 - 7. Wiring and Cables
- I. The Contractor shall visit the site and verify that site conditions are in agreement/compliance with the design package. The Contractor shall report all changes to the site or conditions

that will affect performance of the system to the Contracting Officer in the form of a report. The Contractor shall not take any corrective action without written permission received from the Contracting Officer.

J. Cold Galvanizing: All field welds and brazing on factory galvanized boxes, enclosures and conduits shall be coated with a cold galvanized paint containing at least 95 percent zinc by weight.

K. Interconnection of Console Video Equipment: The Contractor shall connect signal paths between video equipment as specified by the OEM. Cables shall be as short as practicable for each signal path without causing strain at the connectors. Rack mounted equipment on slide mounts shall have cables of sufficient length to allow full extension of the slide rails from the rack.

L. Cameras:

1. Install the cameras with the focal length lens as indicated for each zone.
2. Connect power and signal lines to the camera.
3. Set cameras with fixed iris lenses to the f-stop to give full video level.
4. Aim camera to give field of view as needed to cover the alarm zone.
5. Aim fixed mounted cameras installed outdoors facing the rising or setting sun sufficiently below the horizon to preclude the camera looking directly at the sun.
6. Focus the lens to give a sharp picture (to include checking for day and night focus and image quality) over the entire field of view; and synchronize all cameras so the picture does not roll on the monitor when cameras are selected. Dome cameras shall have all preset positions defined and installed.

M. Monitors:

1. Install the monitors as shown and specified in design and construction documents.
2. Connect all signal inputs and outputs as shown and specified.
3. Terminate video input signals as required.
4. Connect the monitor to AC power.

N. Switcher:

1. Install the switcher as shown in the design and construction documents, and according to the OEM.

2. Connect all subassemblies as specified by the manufacturer and as shown.
 3. Connect video signal inputs and outputs as shown and specified; terminate video inputs as required.
 4. Connect alarm signal inputs and outputs as shown and specified; connect control signal inputs and outputs for ancillary equipment or secondary control/monitoring sites as specified by the manufacturer and as shown.
 5. Connect the switcher CPU and switcher subassemblies to AC power.
 6. Load all software as specified and required for an operational CCTV System configured for the site and building requirements, including databases, operational parameters, and system, command and application programs.
 7. Provide the original and 2 backup copies for all accepted software upon successful completion of the endurance test.
 8. Program the video annotation for each camera.
- O. Video Recording Equipment:
1. Install the video recording equipment as shown in the design and construction documents, and as specified by the OEM.
 2. Connect video signal inputs and outputs as shown and specified.
 3. Connect alarm signal inputs and outputs as shown and specified.
 4. Connect video recording equipment to AC power.
- P. Video Signal Equipment:
1. Install the video signal equipment as shown in the design and construction documents, and as specified by the OEM.
 2. Connect video or signal inputs and outputs as shown and specified.
 3. Terminate video inputs as required.
 4. Connect alarm signal inputs and outputs as required.
 5. Connect control signal inputs and outputs as required.
 6. Connect electrically powered equipment to AC power.
- Q. Camera Housings, Mounts and Poles:

1. Install the camera housings and mounts as specified by the manufacturer and as shown, provide mounting hardware sized appropriately to secure each camera, housing and mount with maximum wind and ice loading encountered at the site.
2. Provide a foundation for each camera pole as specified and shown.
3. Provide a ground rod for each camera pole and connect the camera pole to the ground rod as specified in Division 26 of the VA Master Specification and the VA Electrical Manual 730.
4. Provide electrical and signal transmission cabling to the mount location via a hardened carrier system from the Access Control System and Database Management to the device.
5. Connect signal lines and AC power to the housing interfaces.
6. Connect pole wiring harness to camera.

R. System Start-Up

1. The Contractor shall not apply power to the CCTV System until the following items have been completed:
 - a. CCTV System equipment items and have been set up in accordance with manufacturer's instructions.
 - b. A visual inspection of the CCTV System has been conducted to ensure that defective equipment items have not been installed and that there are no loose connections.
 - c. System wiring has been tested and verified as correctly connected as indicated.
 - d. All system grounding and transient protection systems have been verified as installed and connected as indicated.
 - e. Power supplies to be connected to the CCTV System have been verified as the correct voltage, phasing, and frequency as indicated.
2. Satisfaction of the above requirements shall not relieve the Contractor of responsibility for incorrect installation, defective equipment items, or collateral damage as a result of Contractor work efforts.

S. Supplemental Contractor Quality Control

1. The Contractor shall provide the services of technical representatives who are familiar with all components and installation procedures of the installed CCTV System; and are approved by the Contracting Officer.

2. The Contractor will be present on the job site during the preparatory and initial phases of quality control to provide technical assistance.
3. The Contractor shall also be available on an as needed basis to provide assistance with follow-up phases of quality control.
4. The Contractor shall participate in the testing and validation of the system and shall provide certification that the system installed is fully operational as all construction document requirements have been fulfilled.

3.02 TESTING AND TRAINING

- A. All testing and training shall be compliant with the VA General Requirements, Section 01 00 00 - General Requirements.

END OF SECTION