

Pelco understands that information is critical to success, which is why we are singularly focused on the development of video surveillance and security solutions that provide you the information necessary to make real-time, business-enabling decisions. From the recently introduced VideoXpert video management platform to our industry-leading selection of IP cameras and accessories, Pelco is committed to designing and delivering a broad range of high-quality, IP video security products and systems complemented with an unparalleled level of customer support and services.

For additional information, contact:

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# VIDEO MANAGEMENT SYSTEM

**DIVISION 28 – ELECTRONIC SAFETY AND SECURITY**

**28 20 00 Video Surveillance**

**28 23 00** **Video Management System**

**Notes to Specifier:**

1. Where several alternative parameters or specifications exist, or where, the specifier has the option of inserting text, such choices are presented in **<bold text>.**

2. Explanatory notes and comments are presented in **colored** text.

**VIDEO MANAGEMENT SYSTEM**

## PART 1 GENERAL

### 1.01 SUMMARY

* + 1. Section includes an IP Video Management System.
		2. Related Requirements
			1. 27 20 00 Data Communications
			2. 28 05 00 Common Work Results for Electronic Safety and Security
				1. 28 05 13 Servers, Workstations and Storage for Electronic Safety and Security
				2. 28 05 33 Safety and Security Network Communications Equipment
				3. 28 05 45 Systems Integration and Unified Systems
			3. 28 06 20 Schedules for Video Surveillance
			4. 28 16 15 Access Control Interfaces to Video Surveillance
			5. 28 21 00 Surveillance Cameras
			6. 28 25 00 Video Surveillance Positioning Equipment
			7. 28 31 31.15 Intrusion Detection Interfaces to Video Surveillance
			8. 28 51 15.13 Information Interfaces to Video Surveillance Systems

### 1.02 REFERENCES

* + 1. Abbreviations
			1. API – Applications Programming Interface
			2. CMG – Core and Media Gateway
			3. DHCP – Dynamic Host Client Protocol
			4. FIPS – Federal Information Processing Standard
			5. FISMA - Federal Information Security Management Act
			6. GUI – Graphical User Interface
			7. IP – Internet Protocol
			8. JPEG – Joint Photographic Experts Group
			9. LDAP – Lightweight Directory Access Protocol
			10. MJPEG – Motion JPEG
			11. MPEG – Moving Pictures Experts Group
			12. NSM – Network Storage manager
			13. NTP – Network Time Protocol
			14. ONVIF – Open Network Video Interface Forum
			15. RMF – Risk Management Framework
			16. SNMP – Simple Network Management Protocol
			17. STIG – Security Technical Implementation Guides
			18. TLS – Transport Layer Security
			19. UPS – Uninterruptible Power Supply
			20. VMS – Video Management System
		2. Reference Standards
			1. Network
				1. IEEE 802.3 Ethernet Standards
			2. Video
				1. ISO / IEC 14496 –10, MPEG-4 Part 10 (ITU H.264 or H.265)
				2. ISO / IEC 10918 – JPEG
				3. ONVIF – Profile S
			3. Emissions
				1. FCC-47 CFR Part 15, Class A
				2. CE, Class A
				3. ICES-003, Class A
		3. Definitions
			1. Cell – A defined area within a tab.
			2. Playlist – A series of recorded video clips.
			3. Role – A group of permissions defining abilities and responsibilities within a system.
			4. Tab – A layout populated with sources, e.g. video, and plugins.
			5. Tags – Custom attributes that users with sufficient rights can create and assign to cameras and devices, helping organize resources.
			6. Workspace – A collection of tabs spanning the monitors connected to a workstation.

### 1.03 SUBMITTALS

* + 1. Informational Submittals
			1. Product Data
				1. Manufacturer’s printed or electronic data sheets
				2. Manufacturer’s installation and operation manuals
				3. Warranty documentation
			2. Password assignment plan
			3. Manufacturers Cyber Hardening Guidelines.
			4. Shop Drawings
		2. Closeout Submittals
			1. Final listing of devices and settings
			2. System test results
			3. Statement of compliance with Manufacturer Cyber Hardening Guidelines.

### 1.04 QUALIFICATIONS

* + 1. Manufacturer shall have a minimum of five years’ experience in producing IP video application software.
		2. Installers shall be trained and authorized by the Manufacturer to install, integrate, test, and commission the system.

### 1.05 DELIVERY, STORAGE AND HANDLING

* + 1. Store equipment in a temperature-controlled environment protected from mechanical and environmental conditions as designated by the manufacturer.

### 1.06 WARRANTY, SUPPORT AND LICENSING

* + 1. Manufacturer shall provide a limited 3-year warranty for Manufacturer supplied hardware to be free of defects in material and workmanship. Extended warranty options for a period of up to two (2) additional years shall be available.
		2. Manufacturer shall provide software support and updates for a period of 12 months. Extended support options and extended software update options shall be available.

END OF SECTION

## PART 2 PRODUCTS

### 2.01 EQUIPMENT

* + 1. Manufacturer: Pelco, Inc.

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 Web: www.pelco.com

 E-mail: sales@pelco.com

* + 1. Model VideoXpert Enterprise
		2. Alternates: None

### 2.02 GENERAL DESCRIPTION

* + 1. The Video Management System (VMS) shall be a scalable Microsoft Windows™-based video management and surveillance system consisting of four primary components, as follows:
			1. A core server application to maintain the database of cameras and recording devices and to provide a web-based administrative portal to manage the video surveillance system
			2. A stream management application to route video traffic to users as requested and appropriate
			3. A client presentation application to allow users to view and manage live and recorded video.
			4. A storage management application server to manage the video storage resources on the network.

### 2.03 SYSTEM FUNCTIONS AND CAPABILITIES

**Software system functions are based on using hardware that meets the minimum specifications. No performance guarantee is expressed or implied when the VMS is run on hardware that does not meet the minimum specifications.**

* + 1. The VMS shall be designed for reliability through fault-tolerant, distributed architecture, and multiple levels of redundancy.
		2. The VMS shall provide an open interface that facilitates the creation and deployment of user interface plugins including, but not limited to, video information overlays, access control, license plate recognition, and video content analysis with the option to integrate other 3rd party applications (such as advanced GIS Mapping Interfaces).
		3. Video capabilities
			1. Support recording of MJPEG, MPEG-4, H.264, and H.265 IP video streams
			2. Support megapixel video cameras at least 28 Mbps at 12 MP resolution
			3. Support for ONVIF S profile

**Contact Pelco for a current list of Manufacturer non-ONVIF products supported.**

* + - 1. Aggregate independent VMS deployments across multiple networks and manage all video through a single system while preserving local operation.

**If required, the above capability is provided by VideoXpert**™**.**

* + 1. Basic Analytic capabilities
			1. Motion – Receive motion detection events from cameras
			2. Alarm – Receive detection of physical alarms from cameras within the system, triggering an event
			3. Analytic – Detection of analytic events and edge analytic events from cameras, including those that are free of charge
		2. Advanced Analytics Suite powered by Deep Learning
			1. Detection of Objects (People and Vehicles) from an enabled camera
			2. Configure notifications when objects are detected in zones
			3. Configure notifications when objects move the wrong way though zones
			4. Configure confidence thresholds for object classification within a scene
		3. Each VMS component shall operate on standard commercial off-the-shelf (COTS) hardware.
		4. VMS software updates shall be downloadable from a publicly available website.
		5. The VMS shall indicate system performance and operation status utilizing a variety of reports in csv format.
		6. The Manufacturer shall offer a mobile application with the capability to access live video from up to 500 cameras in both iOS and Android/OS platforms.
		7. The VMS shall be accessible via a web browser with no software installed for live and playback functionality.

### 2.04 MANAGEMENT DATABASE SERVER APPLICATION

**This application is deployed on the Pelco VideoXpert Core**™ **and Media Gateway**™**.**

* + 1. The management database server application shall have central management responsibility, with the following functions and characteristics:
			1. Maintain a database of cameras and recording devices
			2. Define and administer level user accounts, their associated roles, and permissions for the system functions and devices users can access
			3. Support LDAP to associate users in a Microsoft Active Directory with a user and role within the VMS system
			4. Provide basic access to video streaming resources, ensuring that users with appropriate permissions can view video from the system without installed video client software
			5. Supports audio associations with video devices ensuring that users with appropriate permissions can listen to audio associated with video within the Client software application
			6. Search the network for relevant devices
			7. Add discovered cameras to systems by IP address or DNS hostname
			8. Assign resources to video recording schedules
			9. Store videos that operators elect to export from network storage devices for safe keeping, supporting the storage of video clips relevant to an investigation independent of standard recording devices, and locking/unlocking the clips
			10. Create and assign “tags” to efficiently organize cameras and devices within the system, and use tags to create a device tree view
			11. Configure and respond to events within the system
			12. Download reports from the system in csv format contained within a ZIP archive
			13. Perform daily backup at a specified time
			14. Stores exported video, or allows the user to export video to an external location for safe keeping
			15. Deployment options:
				1. independent management database server working with an independent media gateway application server to provide systems functions
				2. combined single server also hosting the stream management application
				3. distributed cluster to provide fault tolerance, scalability and load balancing
				4. virtual machine
		2. 2 RU Hardware
			1. Processor: Intel® Xeon® E3-1275 v3
			2. Operating System: Microsoft® Windows® Server 2016
			3. RAM: 32 GB DDR RAM ECC
			4. SSD Storage: 480 GB
			5. HDD Storage: 1 TB
			6. Video
				1. Graphics: Intel HD Graphics P4700
				2. Memory: Shared
				3. Outputs:

2x DisplayPort

DVI-D

VGA

* + - * 1. Resolution Capability:

DisplayPort: 3840 x 2160 @ 60 Hz

DVI-D, VGA: 1920 x 1200 @ 60 Hz

* + - * 1. Acceptable Web Browsers:

Windows OS: Current version of Google Chrome, Mozilla Firefox, or Microsoft Edge

Mac OS: Firefox 3.5 (or later)

* + - * 1. Acceptable Media Players:

Pelco VideoXpert Ops Center

Pelco Media Player

* + - 1. USB Ports:
				1. USB 2.0: 1x Front, 2x Rear
				2. USB 3.0: 2x Rear
			2. Networking
				1. Interface 2x Gigabit Ethernet (1000Base-T) ports
				2. IP version IPv4 and IPv6
			3. Power
				1. Input 100 to 240 VAC 50/60 Hz, autoranging
				2. Supply Internal
				3. Consumption

100 VAC 160 W, 1.60 A, 547 BTU/hr

115 VAC 160 W, 1.39 A, 547 BTU/hr

220 VAC 160 W, 0.72 A, 547 BTU/hr

* + - 1. Environmental
				1. Operating Temperature 10° to 35°C (32° to 95°F) at unit air intake (front of unit)
				2. Non-Operating Temperature -40° to 65°C (-40° to 149°F)
				3. Operating Relative Humidity 20% to 80% non-condensing
				4. Non-Operating Relative Humidity 10% per hour
				5. Operating Altitude -15 to 3,048 m (-50 to 10m,000 ft)
				6. Operating Vibration 0.25 G at 3 Hz to 200 Hz, at a sweep rate of 0.5 octave/minute
			2. Physical
				1. Dimensions 50.8 x 43.4 x 8.9 cm (20 x 17.1 x 3.5 in)
				2. Mounting 2 RU
				3. Unit Weight 13.06 kg (28.8 lb)
				4. Construction Steel and plastic cabinet
		1. 1 RU Hardware
			1. Processor: Intel® Xeon® Silver 4210
			2. Operating System: Microsoft® Windows® Server 2019
			3. RAM: 64 GB DDR4 ECC
			4. SSD Storage: 900 GB
			5. Video
				1. Graphics: Matrox G200eR2 Graphics
				2. Memory: Shared
				3. Outputs: VGA
				4. Resolution Capability: 1440 x 900 at 60 Hz
				5. Acceptable Web Browsers:

Windows OS: Current version of Google Chrome, Mozilla Firefox, or Microsoft Edge

Mac OS: Firefox 3.5 (or later)

* + - * 1. Acceptable Media Players:

Pelco VideoXpert Ops Center

Pelco Media Player

* + - 1. USB Ports:
				1. USB 2.0: 2x Front
				2. USB 3.0: 2x Rear
			2. Networking
				1. Interface 1GbE Network ports (2x), 10GbE SFP+ ports (2x), and Dedicated iDRAC

port

* + - * 1. IP version IPv4 and IPv6
			1. Power
				1. Input 100 to 240 VAC 50/60 Hz ±5%, autoranging
				2. Supply Dual hot-swappable, redundant power supply (1+1), 550W
				3. Consumption

100 VAC 163 W, 1.5 A, 556 BTU/hr

220 VAC 161 W, 0.7 A, 549 BTU/hr

* + - 1. Environmental
				1. Operating Temperature 10° to 35°C (50° to 95°F) with no direct sunlight on the

equipment

* + - * 1. Non-Operating Temperature -40° to 65°C (-40° to 149°F)
				2. Operating Relative Humidity 10% to 80% relative humidity with 29°C (84.2°F)

maximum dew point, non-condensing

* + - * 1. Non-Operating Relative Humidity 5% to 95% relative humidity with 33°C (91°F) maximum

dewpoint, non-condensing

* + - * 1. Operating Altitude 3,048 m (10,000 ft)
				2. Operating Vibration 0.26 G at 5 Hz to 350 Hz (all operation orientations)
			1. Physical
				1. Dimensions 65.73 x 43.4 x 4.28 cm (25.87 x 17.08 x 1.68 in) without rack ears and

bezel

* + - * 1. Mounting 1 RU
				2. Unit Weight 17.5 kg (38.6 lb)
				3. Construction Steel and plastic cabinet

### 2.05 STREAM MANAGEMENT APPLICATION

**This application is deployed on the Pelco Media Gateway.**

* + 1. Based on a successful determination by the management database server application of a user’s permissions, the stream management connects the user with the appropriate camera, encoder, or recorder device.
		2. The stream management shall be deployed within the VMS in modular fashion to allow expansion of system capabilities or to build redundancies within the system to maximize video availability.
		3. Supports H.264, H.265, MJPEG, and MPEG-4 streams.
		4. Deployment options:
			1. independent management database server working with an independent management database server application to provide systems functions
			2. combined single server also hosting the management database server application
			3. virtual machine

### 2.06 CLIENT APPLICATION

**This application is deployed on the Pelco VxOpsCenter**™**.**

* + 1. The Client application shall be Windows-based, providing an environment from which authorized users can watch live and recorded video on a computer in which the application has been installed.
			1. The Client application shall import users and roles from existing LDAP servers, and enable single sign-on (SSO).
		2. The Client shall be comprised of a main Mission Control panel, which may be hidden, working in unison with a series of windows (workspaces), each providing a tab-based experience.
		3. The Client application shall be capable of connecting to either unicast or multicast.
		4. The Client application shall be able to connect with multiple systems simultaneously.
		5. Workspaces and Tabs
			1. The Client interface shall be based upon workspaces and tabs.
				1. A tab shall be a configurable layout populated with sources of content and plugins contained in cells.
				2. A collection of one or more tab windows shall constitute a workspace.
				3. The Client shall allow configuration and recall of complete workspaces.

An operator with appropriate permissions shall be able to send a saved workspace to other clients, causing their system to launch the saved workspace.

* + - * 1. Any layout of video can be saved as tab to be later recalled by an operator.

Remote tab push: An operator with appropriate permissions shall be able to send a saved tab to other clients, causing their system to launch the saved tab.

* + - * 1. Video in cells shall have the capability for live view, playback search options, and export.
				2. Collaborative Tabs: an operator with appropriate permissions can view a designated collaborative tab so that multiple operators at different stations can see the exact same content and can make changes to live and playback video on this tab that other operators can see in real time.
				3. Shared Display Decoder: Client shall be capable of being designated as an independent Shared Display mode. In this mode:

The client will restart automatically if the machine reboots.

The client will log in with the Shared display account automatically.

The client will restore the last tab and content that was displayed prior to shut down.

The client will accept stream and tab pushes from any connected client with permissions.

The client will be configurable to hide header and footer information, as well as borders, so that only video is shown.

* + - * 1. Cells can be configured to show video without borders such that the video is stretched to cover the available space on the screen without black borders on any side.
				2. Cells can be configured to rotate the video stream 90, 180, -90, or -180 degrees.
		1. Live View and Playback
			1. A list of video and audio sources which users are authorized to access shall be displayed.
			2. Each video source shall indicate a list of current viewers to a user with appropriate permissions.
			3. Each video source that is being viewed shall display whether there are current alarms associated with the source.
			4. The client shall indicate when there has been a reduction in video quality for the displayed video sources.
			5. The client computer shall be able to connect to an unrestricted number of recorders simultaneously to display live and recorded video.
			6. The client shall allow video streams to be selectable from a system tree which can be built by users with appropriate permissions.
			7. The client shall playback audio associated with video sources for users with the correct permissions.
			8. Users shall be able to seamlessly switch between live and recorded video on the fly.
			9. Live View
				1. For live view, cells will be displayed at the highest quality possible, based on the bandwidth and client hardware. The Client application will use the primary stream from a video source as the default; if the bandwidth or client hardware are approaching the limit, the video quality of as many streams as necessary will then be streamed as secondary or at MJPEG quality.
				2. Cells 1/4 the size of the tab or larger shall display the primary stream, and cells smaller than 1/4 the size of the tab shall display the secondary stream to conserve bandwidth and processing power.
			10. Bookmark
				1. The Client shall allow operators to bookmark video

The operator shall be able to specify the name & description of the bookmark.

The operator shall be able to lock video and audio around bookmark and set the time range for the bookmark.

* + - * 1. The Client shall allow operators to search bookmarks by name, description, or time range.
			1. Pan Tilt Zoom (PTZ)
				1. Digital Zoom - An operator shall be able to digitally zoom in a video stream in live or playback mode.
				2. Optical Zoom and Pan Tilt Control: Operators shall be able to control PTZ cameras.
				3. The Client application shall be able to perform digital de-warping of Optera and Evo 180-, 270-, and 360-degree cameras.
			2. Playback
				1. The Client application shall enable synchronized playback of up to nine (9) streams in one tab simultaneously.
				2. The Client application shall have the capability to playback several non-synchronized cameras at one time in different cells.
				3. For viewing recorded video, cells 1/4 the size of the tab or larger shall display full-frame rate video, and cells smaller than 1/4 the size of the tab shall playback only I-Frames to conserve bandwidth and processing power.
				4. When hovering over a recorded video time bar, an operator shall see a thumbnail representing the contents of the video stream at that point in time.
				5. Available playback control functions:

date-time selection

synchronized playback of selected cells within a tab

play video at normal speed

pause video and advance one frame

pause video and rewind 0.5 second

fast forward video at speeds up to 128x

rewind video at speeds up to 128x

jump video forward or back in preset increments and initiates playback

forward video to live playback

take snapshot of the current frame

* + - * 1. Hovering over a video playback cell with a mouse shall display the playback control menu.
			1. The user shall be able to configure a rotating sequence of cameras, allowing the application to cycle through cameras relevant to the operator without intervention.
				1. Using keyboard input alone, the operator can type a camera number, a preset number, or a time (hhmm format) to jump to a selected camera. No mouse input is necessary.
			2. The user shall be able to create a sequence of cameras by dragging and dropping camera names in a single user interface.
				1. The user shall be able to configure a rotating sequence of cameras, allowing the application to cycle through cameras relevant to the operator without intervention.
				2. The user shall be able to configure a sequence of cameras that appear on alarm, allowing the application to cycle cameras when an event or alarm relevant to the user occurs.
		1. Investigations
			1. An investigation mode shall be available to provide multiple layouts (1x1, 2x2, and 3x3) with synchronized playback controls, allowing users to fully investigate a scene from multiple angles.
			2. The investigation mode shall display recording types for motion, analytics, and alarms in recorded video.
			3. The investigation mode shall enable operators to synchronize video playback and export investigative playlists covering scenes of interest in forward or reverse at speeds up to 128 times normal playback.
			4. Users shall be able to create playlists from multiple video clips encompassing selected scenes from an investigation. Audio shall be included any time it is associated with a video clip.
			5. Operators shall be able to save an investigation, preserving the associated device list and any created clips for later recall.
				1. Saved investigations shall be capable of being shared with other operators.
			6. Operators shall be able to export individual video clips or entire playlists.
			7. Administrators can configure the system to save exports to a shared network drive for evidentiary safe-keeping and quick access.
			8. Investigation mode shall allow video clips from cameras of interest to be clipped to shorter times to allow for smaller video exports.
			9. Investigation mode shall be a built-in application, provided at no additional cost.
			10. Investigation mode shall have the ability to create multiple clips, allowing views from any camera to be added to an exported playlist.
		2. Export
			1. The Client shall allow a user to preview the export playlist prior to creating the finished export.
			2. The Client shall initiate an export on the server independent of the client workstation; allowing the user to logoff or use their workstation for other tasks.
			3. An operator shall be able to create a JPG or PNG snapshot image of the current frame of video in a cell. The user shall be able to include the camera name and timestamp in the snapshot.
			4. An operator shall be able to select encryption of exports prior to the export, and the export shall be able protected by the user-entered password.
			5. The system shall save the export and permit the operator to download the export to any system-accessible media including locally to HDD, CD/DVD, Flash USB device or to network storage.
		3. Display
			1. The Client application shall allow at least four (4) 1080p resolution streams per monitor and support 60 fps camera streams per monitor.
		4. Events
			1. The Client application shall enable an operator to respond to events.
			2. The Administrator shall specify which Clients shall receive notifications by user role.
			3. Certain events shall be configurable for acknowledgement.
				1. Acknowledgement options:

snoozed

in process

acknowledged

* + 1. Relays – For devices that have a physical relay that is enabled on the VMS System, the Client application shall enable operators to activate or deactivate relays.
		2. Plugins – The Client application shall support an open interface that facilitates the creation and deployment of user interface plugins including, but not limited to, mapping, video information overlays, access control, license plate recognition, and video content analysis with the option to integrate other third-party applications (such as advanced GIS Mapping Interfaces).
		3. System and Device Information
			1. Information management
				1. The Client application shall provide a mechanism to create and assign metadata to devices.
				2. A primary device list shall be apparent in the Client application, and devices shall be assignable to folders.

The device list shall be sortable by device name or device number.

The device list shall be able to be filtered by the following terms:

simple text-based filter, matching the device name or device number

tag-based filtering, showing devices matching the intersection of all assigned tags

status-based filtering, showing devices with a particular status

* + - 1. User Roles, as assigned by a System Administrator, shall define the limits of a user’s ability to access live or recorded video and to export video and other standard client operations.
				1. Authorized users shall be able to share views, including window arrangements and camera selections, with other users, for purposes of collaboration.
			2. When using a mouse to hover over a device in a listing, a popup shall appear with the following information:
				1. Device name
				2. Thumbnail image
				3. Device state
				4. Associated tags
				5. IP Address
		1. Desktop Workstation™Hardware
			1. Processor: Intel Core™ i7-8700
			2. Operating System: Microsoft Windows 10 IoT Enterprise 64-bit (LTSC)
			3. OS Drive: m.2 256 GB
			4. RAM: 16 GB DDR4
			5. Video
				1. Outputs: 4x Mini DisplayPort
				2. System NVIDIA Quadro P620 (2 GB memory)
				3. Maximum Video Resolution Per Output Type

mDP 1.4 direct connect HDR 5120 x 2880 at 60 Hz (30-bit color)

* + - 1. Optical Drive DVD±RW
			2. Audio
				1. Inputs Universal Audio Jack (front)
				2. Outputs Universal Audio Jack (front), Line Out (rear), Internal Speaker, 4x Mini DisplayPort, Audio
				3. Connector Types 3.5 mm 4 pole (In/Out), 3.5 mm 3 pole (Out), mDP cable (Out)
			3. USB Ports
				1. USB 2.0 2x front, 2x rear
				2. USB 3.0 1x front, 4x rear
				3. USB 3.1 Type-C 1x front
			4. Networking
				1. Gigabit Ethernet (1000Base-T) ports 1x
				2. IP Version IPv4 and IPv6
			5. Browser Current version of Google Chrome, Mozilla Firefox, or Microsoft Edge
			6. Power
				1. Input 90 to 264 VAC, 3.2 A maximum
				2. Supply Internal 200 W
				3. Consumption 683 BTU/hr maximum (200 W power supply)
			7. Environmental
				1. Temperature

Operating 10° to 35°C (50° to 95°F) with no direct sunlight

Storage -40° to 65°C (-40° to 149°F)

* + - * 1. Operating Humidity 5% to 95%, non-condensing
				2. Non-Operating Relative Humidity 10% to 90%. non-condensing
				3. Operating Altitude -15.2 to 3048 m (-50 to 10,000 ft)
				4. Operating Vibration 0.66 GRMS
			1. Physical
				1. Dimensions 29.0 x 29.2 x 9.26 cm (11.4 x 11.5 x 3.6 in)
				2. Unit Weight (varies by configuration) 5.14 kg (11.42 lb)
		1. Rackmount Workstation™Hardware
			1. Processor: Intel® Core i7-9700K
			2. Operating System: Microsoft® Windows 10 IoT Enterprise 64-bit (LTSC)
			3. RAM: 16 GB DDR4
			4. SSD Storage: 256 GB
			5. Video
				1. Graphics:

**VX-RKWKST:** NVIDIA Quadro P620 (1x)

**VX-RKWKS8T**: NVIDIA Quadro P620 (2x)

* + - * 1. Memory: 2 GB GDDR5
				2. Outputs:

Mini DisplayPort 1.4 (4x), enabling use of up to four monitors per workstation—either four native, or two native and two using Enhanced Decoders, depending on the decoder model, with the option for independent CPUs displaying up to 25 streams per monitor.

**Reference Pelco VX-RKWKST**

Mini DisplayPort 1.4 (8x), enabling use of up to eight monitors per workstation—two native and six using Enhanced Decoders, with the option for independent CPUs displaying up to 25 streams per monitor.

**Reference Pelco VX-RKWKS8T**

* + - * 1. Resolution Capability:

DisplayPort 3840 x 2160 @ 60 Hz

* + - 1. USB Ports:
				1. USB Type-A 3.1 Gen1 2x Front
				2. USB Type-C 3.1 Gen2 1x front, 2x Rear
				3. Networking Interface 1 Gigabit Ethernet (1000Base-T), 10 Gigabit Ethernet

(10GBase-T)

* + - * 1. IP version IPv4 and IPv6
			1. Power
				1. Input 100 to 240 VAC 50/60 Hz ±5%, autoranging
				2. Supply Internal
				3. Consumption 550 W, 7.4 A / 3.7 A (maximum)
			2. Environmental
				1. Operating Temperature 10° to 35°C (50° to 95°F) at unit air intake (front of unit)
				2. Non-Operating Temperature -40° to 65°C (-40° to 149°F)
				3. Operating Relative Humidity 10% to 85%, non-condensing
				4. Non-Operating Relative Humidity 10% to 90%, non-condensing
				5. Operating Vibration 0.26 GRMS
			3. Physical
				1. Dimensions 57.75 x 48.2 x 4.28 cm (22.73 x 18.97 x 1.68 in)
				2. Mounting 1 RU
				3. Unit Weight 12.42 kg (27.38 lb)
				4. Construction Steel and plastic cabinet

### 2.07 INTEGRATIONS

* + 1. Plugins shall be able to be created by third-party developers using a vendor-provided API that is a RESTful open-standard architecture to communicate with the VMS system.
		2. Plugins shall be built using programming languages that can make HTTP requests and parse JSON responses.
		3. API clients shall interact with VMS using the HTTP methods of GET, POST, PATCH, PUT, and DELETE.

### 2.08 EXPORT PLAYER

* + 1. The Client shall distribute a standalone application for export playback.
		2. The Client shall be optionally included with downloaded exports.
		3. The Client shall provide tamper validation via a check sum.
		4. The Client shall provide a means to playback exported video and audio in two methods.
			1. Sequentially – play video and audio in the order arranged in the export playlist.
			2. 4-Up - plays 4 simultaneous streams of video and audio in a time synchronized manner, from the export playlist.
		5. The Client shall provide de-warping and Immersive PTZ for Optera and Evo cameras.
		6. The Client shall provide a re-export method to convert video into .AVI or .MP4.

### 2.09 CLIENT WEB APPLICATION

* + 1. The Client application shall be browser-based, providing an environment from which authorized users can watch live and recorded video on a computer in which has access to the system.
		2. The Client shall be comprised of a main Mission Control panel, working in unison with a series of tabs.
		3. Tabs
			1. A tab shall be a configurable layout populated with sources of content contained in cells.
			2. Video in Cells shall have the capability for, live view, playback, and export.
		4. Live View and Playback
			1. A list of video and audio sources which users are authorized to access shall be displayed.
			2. Each video source that is being viewed shall display whether there are current alarms associated with the source.
			3. The client computer shall be able to connect to an unrestricted number of recorders simultaneously to display live and recorded video.
			4. The client shall allow video streams to be selectable from a system tree which can be built by users with appropriate permissions.
			5. Users shall be able to seamlessly switch between live and recorded video on the fly.
			6. Video Quality shall be sufficient for video streaming via
				1. Motion JPEG
				2. H.264
			7. Bookmark
				1. The Client shall allow operators to bookmark video

The operator shall be able to specify the name & description of the bookmark.

The operator shall be able to lock video and audio around bookmark and set the time range for the bookmark.

* + - * 1. The Client shall allow operators to search bookmarks by name, description, or time range.
			1. Pan Tilt Zoom (PTZ)
				1. Digital Zoom - An operator shall be able to digitally zoom in a video stream in live or playback mode.
				2. Optical Zoom and Pan Tilt Control: Operators shall be able to control PTZ cameras.
				3. The Client application shall be able to perform digital de-warping of Optera 180-, 270-, and 360-degree cameras.
			2. Playback
				1. The Client application shall have the capability to playback non-synchronized cameras at one time in different cells.
				2. Available playback control functions:

date-time selection

play video at normal speed

fast forward video at speeds up to 128x

rewind video at speeds up to 128x

forward video to live playback

take snapshot of the current frame

* + - * 1. Hovering over a video playback cell with a mouse shall display the playback control menu.
			1. Using keyboard input alone, the operator can type a camera number, a preset number, or a time (hhmm format) to jump to a selected camera. No mouse input is necessary.
		1. Export
			1. The Client shall allow a user to create quick export in one- or five-minute increments.
			2. The Client shall initiate an export on the server independent of the client workstation; allowing the user to logoff or use their workstation for other tasks.
			3. An operator shall be able to create a JPG snapshot image of the current frame of video in a cell.
			4. An operator shall be able to select encryption of exports prior to the export, and the export shall be able protected by the user-entered password.
			5. The system shall save the export and permit the operator to download the export to any system-accessible media including locally to HDD, CD/DVD, Flash USB device or to network storage.
		2. Events
			1. The Client application shall enable an operator to respond to events.
			2. The Administrator shall specify which Clients shall receive notifications by user role.
			3. Certain events shall be configurable for acknowledgement.
				1. Acknowledgement options:

snoozed

in process

acknowledged

* + 1. Relays – For devices that have a physical relay that is enabled on the VMS System, the Client application shall enable operators to activate or deactivate relays.
		2. System and Device Information
			1. Information management
				1. The Client application shall provide a mechanism to create and assign metadata to devices.
				2. A primary device list shall be apparent in the Client application, and devices shall be assignable to folders.

The device list shall be sortable by device name or device number.

The device list shall be able to be filtered by the following terms:

simple text-based filter, matching the device name or device number

tag-based filtering, showing devices matching the intersection of all assigned tags

status-based filtering, showing devices with a particular status

* + - 1. User Roles, as assigned by a System Administrator, shall define the limits of a user’s ability to access live or recorded video and to export video and other standard client operations.
				1. Authorized users shall be able to share views, including window arrangements and camera selections, with other users, for purposes of collaboration.
			2. When using a mouse to click on a device in a listing, a popup shall appear with the following information:
				1. Device name
				2. Thumbnail image
				3. Device state
				4. Associated tags
				5. IP address

### 2.10 STORAGE MANAGEMENT APPLICATION SERVER

**This application is deployed on Pelco VxStorage**™**.**

* + 1. The storage management application server shall incorporate both server functions and storage elements into a purpose-built chassis.
		2. The storage management application server shall not require removal from its rack installation when hard disk drives or power supplies must be replaced.
		3. The storage management application shall record video and audio streams from IP cameras and video encoders on the network.
			1. Video: H.264 or H.265 in High, Main, or Base Profile streams from both standard resolution and megapixel cameras
		4. The storage management application server shall support extension through network storage, allowing the server to preserve and extend the life of video by moving it to an external, network storage location.
		5. The storage management application server shall support failover, allowing a storage management application server to act as a hot standby for any number of other, active storage management application servers.
		6. The storage management application shall have the following further functions and characteristics:
			1. Employ the Windows Server 2016 or 2019 operating system
			2. Use RAID 6 parity across the storage drives to protect recorded data against a hard disk drive failure
			3. Use enterprise-level hard disk drives specifically rated for operation in RAID systems
			4. Employ the following redundancy features
				1. Redundant, hot swappable power supply modules
				2. Designed for online service and maintenance and cannot be removed from the rack when hard disk drives or power supplies must be replaced.
			5. Guaranteed recording throughput: 450 Mbps and up to 300 total cameras per storage device under normal and error (RAID rebuild) conditions
			6. Guaranteed downloading throughput: 250 Mbps per storage device under normal and error (RAID rebuild) conditions.
			7. The storage server shall natively support cameras supporting ONVIF Profile S.

**Includes** **Pelco Optera cameras**

* + - 1. Support continuous, scheduled, alarm/event (including analytic), and motion
				1. Pre- and -post alarm periods shall be configurable
			2. Support bookmarking of video content
			3. Support recording of up to three video streams
			4. Support privacy tools that allow administrators to establish maximum retention times for video
			5. Ability to report all diagnostic events, including software status diagnostics to a centralized user interface
			6. Fully manageable from a remote workstation, including the ability to configure settings and update firmware and software
			7. Capable of interfacing with a UPS using a USB connector
				1. The network video recorder shall receive status and control signals from the UPS when it is in backup mode, informing the operator about the amount of charge remaining and triggering a controlled shutdown when the charge becomes zero.

**Pelco recommends the APC Smart-UPS.**

* + - 1. Ability for an administrator to enable pruning of previously recorded video by removing P-frames and retaining I-frames only, after a specified duration of days.
		1. Hardware
			1. Processor:
				1. **VXS2-T** Intel® Xeon® Silver 4210
				2. **VXS2-E** Intel® Xeon® Silver 4210 (x2)
			2. Operating System: Microsoft® Windows® Server 2019
			3. RAM: 32 GB DDR4 ECC
			4. Storage 240 GB (x2)
				1. RAID Level RAID 1
			5. HDD:
				1. Storage Up to 288 TB
				2. RAID Level RAID 6
				3. Effective Capacity

**VXS2-T0N** 0 TB

**VXS2-T96-N8** 72.76 TB

**VXS2-T144-N12** 109.14 TB

**VXS2-E168-N12S** 128 TB

**VXS2-E216-N12** 174.62 TB

**VXS2-E216-N12S** 171 TB

**VXS2-E288-N16S** 238.42 TB

* + - 1. Video
				1. VGA Interface **VXS models are configured remotely via web interface**
				2. Resolution Capability:

VGA: 1920 x 1200 @ 60 Hz

* + - 1. USB Ports:
				1. USB 2.0: 2x Front
				2. USB 3.0: 2x Rear
			2. Networking
				1. Interface

**VXS2-T** 2x 1GbE Network Ports, 2x 10GbE SFP+ ports and Dedicated iDRAC port

**VXS2-E**  4x 1GbE Network Ports, 2x 10GbE SFP+ ports and dedicated iDRAC port

* + - * 1. Throughput

**VXS2-T**

1GbE 700 Mbps recording / 175 Mbps playback (simultaneously)

10GbE 1000 Mbps recording / 175 Mbps playback (simultaneously)

**VXS2-E**

1GbE 700 Mbps recording / 175 Mbps playback (simultaneously)

10GbE 2500 Mbps recording / 175 Mbps playback (simultaneously)

* + - * 1. IP version IPv4 and IPv6
			1. Power
				1. Input 100 to 240 VAC 50/60 Hz, autoranging
				2. Supply Internal, redundant, hot-swappable
				3. Consumption based on maximum capacity

**VXS2-T**

110 VAC: 634.5 W, 3.0 A, 2165 BTU/hr

220 VAC: 620.1 W, 1.5 A, 2115.9 BTU/hr

**VXS2-E**

110 VAC: 872.7 W, 4.7A. 2977.8 BTU/hr

220 VAC: 847.3 W, 2.3A, 2891.1 BTU/hr

* + - 1. Environmental
				1. Operating Temperature 10° to 35°C (32° to 95°F) with no direct sunlight
				2. Non-Operating Temperature -40° to 65°C (-40° to 149°F)
				3. Operating Relative Humidity 10% to 80% relative humidity with 29°C (84.2°F) maximum dew point
				4. Non-Operating Relative Humidity 5% to 95%, non-condensing
				5. Operating Altitude -15 to 3,048 m (-50 to 10,000 ft)
				6. Operating Vibration 0.26 Grms at 5 Hz to 350 Hz (all three axes)
			2. Physical
				1. Dimensions

**VXS2-T**: 64.8 x 43.7 x 13.2 cm (25 x 17.2 x 5.2 in) without rack ears and bezel

**VXS2-E**: 70.08 x 43.4 x 8.68 cm (27.59 x 17.09 x 3.42 in) without rack ears and

bezel

* + - * 1. Mounting 2 RU
				2. Unit Weight

**VXS2-T**: 29.68 kg (65.43 lb) with maximum number of drives

**VXS2-E**: 33.1 kg (72.91 lb) with maximum number of drives

* + - * 1. Construction Steel and plastic cabinet

### 2.11 STORAGE MANAGEMENT SOFTWARE OPTION

* + 1. Storage management software shall be available as an option to allow users to implement integrated storage management software features on existing hardware.
		2. Storage management software can be on a per-camera-license basis.
		3. Storage management software shall allow migration of older hardware from the same vendor to the software capability of the latest version of the storage management software.
		4. In software only mode, the storage management software can operate in RAID0, RAID5, or RAID6 configuration on third-party-compatible hardware.
		5. Hardware – Storage Management Application Server section, above.

### 2.12 DECODER HARDWARE

* + 1. The HD video decoder shall support any digital video stream on the network and allow for the decoding of up to 25 simultaneous streams from any video encoder or recorder. It shall also allow for simultaneous and independent viewing of both live and recorded video.
		2. Video decoder hardware will be of compact size, allowing it to be mounted behind the monitor on a standard 100x100 VESA mount included in the decoder hardware supply. VGA/DVI/HDMI cable extensions shall not be accepted.
		3. The HD video decoder shall allow the creation of Video Wall capability within the VMS.
		4. The HD video decoder hardware shall not require a login and shall be synchronized with the VMS Client application.
		5. The HD video decoder must decode H.264 or H.265 in High, Main, or Base profiles; and MJPEG and MPEG-4 encoded video streams.
		6. The HD video decoder shall have the capability to decode up to sixteen 4CIF resolution, 30 images per second (ips) MPEG-4 encoded video streams simultaneously; or up to twelve H.264 or H.265 Baseline, 4CIF resolution, 30 ips video streams simultaneously; or up to four 1080p streams at 30 ips encoded in H.264 or H.265 Baseline profile. De-warping of views for fisheye or multi-sensor cameras will be supported. Decoder hardware can optimize bandwidth consumption and CPU processing requirements by automatically subscribing to a lower resolution, lower bit-rate stream from a given camera depending on current load and screen configuration.
		7. The HD video decoder will drive one 1920 x 1080 monitor through HDMI connections for displaying the video footage.
		8. The HD video decoder will allow for a maximum of five (5) additional monitors to be connected and allow control of the monitors from a single Client application. Each additional monitor shall require a dedicated decoder. This shall include the ability to use a mouse and keyboard for the workspace that has a total of six (6) monitors—five (5) with decoder and one (1) with the Client PC.
		9. The HD video decoder hardware shall be small enough to be installed behind the monitor VESA mount. This allows the monitor to be installed further from the Client machines than possible with the usual cable limitations of VGA/DVI/HDMI cables.
		10. Diagnostics to be systemized with other system components. Any faults shall be reported to users that have subscribed to diagnostic alarms regardless of where the user is located.
		11. Hardware
			1. Processor:
				1. Shared Display Decoder Intel® Core™ i7-10700T
				2. Enhanced Decoder Intel® Core™ i7-9700T
			2. Operating System:
				1. Shared Display Decoder: Windows 10 IoT Enterprise 64-bit (LTSC)
				2. Enhanced Decoder: Linux Xubuntu 19.10
			3. RAM:
				1. Shared Display Decoder 16 GB DDR4
				2. Enhanced Decoder 8 GB DDR4
			4. SSD Storage: 128 GB
			5. Video
				1. System Intel UHD
				2. Memory Shared
				3. Outputs

DisplayPort (2x)

HDMI

* + - * 1. Resolution Capability:

DisplayPort: 3840 x 2160 at 60 Hz

HDMI 1920 x 1080 at 60 Hz

* + - * 1. Video Coding H.264 in High, Main, or Base profiles; MPEG-4; or H.265
				2. Decoding Performance 16X real-time MPEG-4 streams at 704 x 480/576; 16X real-time H.264 or H.265 Baseline streams at 704 x 480/576;

 8X 720p H.264 or H.265 Baseline streams; 4X 1080p H.264 or H.265 Baseline streams

* + - 1. USB Ports:
				1. USB 3.1: 1x Front, 4x Rear
				2. USB 3.1 Type-C: 1x Front
			2. Networking
				1. Interface 1x Gigabit Ethernet (1000Base-T) ports
				2. IP version IPv4
			3. Power
				1. Input 100 to 240 VAC, 50/60 Hz, autoranging
				2. Supply

Shared Display Decoder External, 130 W

Enhanced Decoder External, 90 W

* + - * 1. Consumption 222 BTU/hr max
			1. Environmental
				1. Operating Temperature 5° to 35°C (41° to 95°F)
				2. Non-Operating Temperature -40° to 65°C (-40° to 149°F)
				3. Operating Relative Humidity 20% to 80%, non-condensing
				4. Non-Operating Relative Humidity 10% per hour
				5. Operating Altitude –15 to 3,048 m (–50 to 10,000 ft)
				6. Operating Vibration 0.66 Grms
			2. Physical
				1. Dimensions 3.6 x 17.8 x 18.2 cm (1.4 x 7.0 x 7.2 in)
				2. Unit Weight 1.41 kg (3.12 lb)
				3. Construction Steel and plastic cabinet

### 2.13 CYBERSECURITY

* + 1. The VMS core server application user interface shall support the following:
			1. client authentication
			2. TLS-based encryption over HTTPS
			3. configurable roles and permissions
			4. retrieval of logs and reports of user actions
		2. System software shall be able to operate without conflict alongside antivirus software.
		3. System servers shall not store passwords in an unencrypted format.
		4. System shall enforce the changing of default passwords upon initial use of the system.
		5. System shall support encrypting exports.
		6. The VMS Accessory Server shall support HTTPS when acting as a proxy load balancer for the VMS core server.
		7. The VMS server components shall support synchronized system clocks using NTP.
		8. The system shall support functionality with FIPS-validated cryptographic modules and DISA-STIGs applied.
		9. The system shall support RMF-compliant configurations (FISMA/NIST).

### 2.14 SUPPORT SERVICES SERVER

**Pelco VideoXpert Core**™ **and Media Gateway™ Accessory Server Features**

* + 1. The accessory server shall provide NTP services for the video surveillance network. It shall act as a pass through, getting time from an external time server, or it shall provide its own system time as the definitive time for the video surveillance network.
		2. The accessory server is a load balancer sufficient for networks with two CMG servers. It shall support VideoXpert clusters with two CMG servers in an active-failover scheme. In this scheme, both servers shall field requests, but the system will continue operating if either CMG server in the cluster fails.
		3. The accessory server shall act as a DHCP server for devices on the VMS network, if necessary. Users can toggle DHCP functionality on or off as necessary and specify ranges of addresses.

### 2.15 3D MOUSE CONTROLLER

* + 1. The 3D Mouse shall be compatible with all distributed network video management components.
		2. Patented six-degrees-of-freedom (6DoF) sensor to precisely navigate digital models or camera positions in 3D space.
		3. Advanced ergonomic design – The full-size, soft-coated hand rest shall position the hand comfortably, and 15 large, soft-touch, function keys allow quick access to frequently used commands.
		4. QuickView Keys – Fingertip access to 12 views facilitating switch cameras.
		5. Intelligent Function Keys –Access to 4 application commands for an optimized workflow.
		6. On-Screen Display – Provides a visual reminder of function key assignments on your computer screen.
		7. 3D Space Mouse Modifiers – Fingertip access to Ctrl, Shift, Alt and Esc keys saves time by reducing the need to move your hand between mouse and 3D Mouse.
		8. Virtual NumPad – Allows direct numerical input into your application using your standard mouse rather than the 3D Mouse.
		9. The 3D Mouse shall be part of an integrated system and shall be configured so any number can be added to the system. When combined with user interfaces (UIs), network storage managers (NSM’s), encoders, IP cameras, and video consoles, the 3D Mouse forms an integral part of a complete network-based video control system.
		10. Hardware
			1. Power Supply
				1. Input Connector Type Universal, interchangeable
			2. Connectivity
				1. 3D Space Mouse Interface USB 2.0
				2. Cable USB
			3. Module Specifications
				1. 3D Space Mouse Keypad
				2. Joystick Fully proportional PTZ, variable speed; with zoom, iris, and focus controls
			4. Physical
				1. Dimensions 204 x 142 x 58 cm (8.0" D x 5.6" W x 2.3" H)
				2. Unit Weight 665 g (1.47 lbs)
			5. Environmental
				1. Operating Temperature 0° to 40°C (32° to 104°F) air intake of unit
				2. Storage Temperature –40° to 65°C (–40° to 149°F)

### 2.16 KEYBOARD

* + 1. The VMS shall provide keyboard functionality.
		2. The keyboard shall also:
			1. be compatible with all distributed network video management systems.
			2. support USB 2.0 protocol, operating at full speed.
		3. System Requirements
			1. Windows Vista, Windows 7, Windows 8 / 8.1, or Windows 10
			2. Two (2) USB ports
			3. 70 MB of available hard disk space

END OF SECTION

## PART 3: EXECUTION

### 3.01 INSTALLERS

* + 1. Contractor personnel shall comply with all applicable state and local licensing requirements.

### 3.02 PREPARATION

* + 1. The network design and configuration shall be verified for compatibility and performance with the camera(s).
		2. Network configuration shall be tested and qualified by the Contractor prior to system installation.

### 3.03 INSTALLATION

* + 1. Contractor shall follow all manufacturer published installation and configuration instructions and guidelines.

### 3.04 STORAGE

* + 1. Server hardware shall be stored in an environment where temperature and humidity are in the range specified by the Manufacturer.

END OF SECTION