

**SECTION 28 23 00**  
**IP VIDEO SURVEILLANCE SYSTEM**

**PART 1 - GENERAL**

DESCRIPTION OF WORK **NOTE: IP VIDEO SURVEILLANCE EQUIPMENT, SUPPORTS AND DEVICES ~~ARE~~ SHALL BE DELETED AS PART OF ALTERNATE 4. (~~PROVIDE CONDUIT, BOXES AND PULLWIRE FOR ROUGH-IN ONLY UNDER BASE BID.~~ SHALL BE PROVIDED).**

**1.1**

- A. Include all labor, materials, tools, transportation, storage costs, excavation, training, equipment, software, insurance, temporary protection, permits, inspections, taxes and all necessary and related items required to provide a complete and operational IP Video Surveillance System as shown on the Drawings and described in the Specifications.
- B. Furnish, install, mount, secure, aim, focus, adjust, connect power to, connect to the network, assign IP addresses, configure, test, commission and demonstrate all IP video surveillance cameras.
- C. Furnish and install all necessary camera mounts and supports including ceiling mount kits, trim rings, gooseneck supports, corner mounts, pendant mounts, brackets, support arms, pole mounts, etc.
- D. Furnish and install 120VAC to 24VAC power supplies and conductors for PTZ cameras and PTZ camera housings.
- E. Furnish, install, update and configure network video recorders (NVRs).
- F. Provide NVR software and software licenses as indicated on the drawings.
- G. Furnish, install, update and configure video management "viewing" software on all workstation computers shown on the drawings to enable users to view surveillance camera images and control cameras.
- H. Test, commission and demonstrate the entire IP video surveillance system in the presence of the Owner's Representative.
- I. Provide a minimum of eight (4) hours training to the Owner on the usage and operation of the IP video surveillance cameras, network video recording servers and client software.
- J. Provide one (1) year maintenance and service agreement for the entire video surveillance system from the date of Substantial Completion. During this period, the contractor will repair and/or replace any failed components, will provide scheduled maintenance and will respond to service related calls.

**1.2 QUALITY ASSURANCE**

- A. The Contractor installing the IP video surveillance cameras and video recording software must have a minimum of (5) years experience installing video surveillance systems of similar size and scope.
- B. The Contractor installing the IP video surveillance system must be a firm normally engaged in the design, installation and maintenance of integrated security systems including access control, intrusion detection, fire alarm and video surveillance.
- C. The Contractor installing the IP video surveillance system shall be a Panaonic I-Pro Certified Reseller.
- D. The Contractor must be licensed by the Nevada State Contractors Board.
- E. Formal, written evidence of the following may be requested at any point during the Bid or installation processes:
  1. If requested, the Contractor, including any subcontractor, shall show proven expertise in the implementation of video surveillance

projects. This expertise can be illustrated through the inclusion of details of at least three (3) projects involving the design and installation of video surveillance systems within the past three year period of similar size and scope. Names, addresses, and telephone numbers of references for the three projects shall be included.

2. In the event subcontractors are used for any portion of the installation or acceptance testing, the Contractor shall be responsible for any subsequent corrective action required on that portion of the work.

### **1.3 SUBMITTALS**

#### **A. Manufacturer's Data Sheets**

1. Submit minimum 6 copies. Architect/Engineer will retain a minimum of 3 copies and return balance to Contractor.
2. Data sheets must be bound in 3-ring binders. Provide a table of contents for each binder indicating the products submitted. Products listed in the table of contents should be in the same order as they appear in the Specifications.
3. Where pre-printed data covers more than one distinct item, mark data sheet to clearly indicate which item is to be provided. Delete or cross-out non-applicable data.
4. Provide manufacturer data sheets for the following equipment and software:
  - a. Fixed Indoor Vandal Resistant Dome Cameras.
  - b. Fixed Outdoor Vandal Resistant Dome Cameras with IR.
  - c. PTZ Surface Mounted Vandal Resistant Cameras w/Environmental Housings.
  - d. Fixed Dome Camera Ceiling Support Brackets.
  - e. Outdoor Gooseneck Wall Mounts.
  - f. Outdoor Wall Corner Mounts.
  - g. 120VAC to 24VAC Power Supplies.
  - h. Network Video Recorders and Software.

### **1.4 REGULATIONS AND CODE COMPLIANCE**

- A. The Contractor will comply with all applicable governmental regulations including Federal, State, City, and local applicable codes and ordinances.
- B. References to codes and standards called for in the Specifications refer to the latest edition, amendments, and revisions to the codes and standards in effect on the date of these Specifications.
- C. All work and materials shall conform to and be installed, inspected and tested in accordance with federal, state and local governmental agencies, including, but not limited to the following
  1. ANSI/NFPA-70, 2002 -- National Electrical Code (NEC).
  2. Underwriter's Laboratories, Inc. (UL).
  3. Federal Communications Commission (FCC).
  4. Americans with Disabilities Act (ADA).

### **1.5 INTENT OF DRAWINGS**

- A. All drawings are diagrammatic unless otherwise noted as detailed dimensioned drawings. Drawings show approximate locations of equipment and devices. Exact locations are subject to the approval of the Owner or Owner's Representative. The Contractor shall verify dimensions and shall be responsible for their accuracy.
- B. Items mentioned in the Specifications and not shown in the Drawings, or shown in the Drawings and not mentioned in the Specifications, shall be of like effect as if shown and mentioned in both. In the case of

differences between the Drawings and the Specifications, the stricter provision as determined by the Owner or Owner's Representative shall govern.

- C. Omissions from the Drawings or Specifications, or the incorrect description of details of Work which are necessary to carry out the intent of the Drawings and Specifications, or work which is customarily performed, shall not relieve the Contractor from performing such omitted or incorrectly described work.
- D. No exclusion from, or limitations in, the language used in the Project Documents shall be interpreted as meaning that ancillary or accessory items necessary to complete any required system or item of equipment are to be omitted.

#### **1.6 REVIEW OF SPECIFICATIONS**

- A. Prior to submitting a bid for the Project, the Contractor shall carefully study and compare the Drawings and Specifications and shall at once report to the Owner or Owner's Representative any error, inconsistency or omission discovered. During construction, if the Contractor performs any construction activity knowing it involves a recognized error, inconsistency or omission in the Specifications without such notice to the Owner or Owner's Representative, the Contractor shall assume appropriate responsibility for such performance and shall bear an appropriate amount of the cost for any correction.

#### **1.7 EXAMINATION OF THE PREMISES**

- A. The Contractor shall visit the Site to become familiar with the local conditions under which the work is to be performed and correlate his observations with the requirements of the Drawings and Specifications. No allowance will be made for claims of concealed conditions which the Contractor learned or should have learned in exercising due diligence in its observations of the site and review of the local conditions.
- B. Before ordering any materials or performing any work, the Contractor shall verify all measurements and be responsible for correctness of same. No extra charge or compensation will be allowed for duplicate work or material required because of an unverified difference between an actual dimension and the measurement indicated in the Drawings. Any discrepancies found shall be submitted in writing to the Owner or Owner's Representative for consideration before proceeding with the work.

#### **1.8 DELIVERY, STORAGE AND HANDLING**

- A. All items to be installed as a component of the IP video surveillance system for the Project shall be stored according to manufacturer's recommendations. In addition, all items must be stored in a location protected from vandalism and weather. Items shall not be stored outside. If air temperature at the storage location shall be below 40 degrees F, the equipment shall be moved to a heated 50 degrees F (minimum) location. If necessary, equipment shall be stored off site at The Contractor's expense.

#### **1.9 SUBSTITUTIONS**

- A. After the Contract is awarded, requests to substitute for specified materials shall be submitted by the Contractor to the Owner or Owner's Representative within thirty (30) days, complete with reasons for the substitution and savings which accrue to the Owner if the substitutions are approved. Substitutions after Contract award will be considered only if the substitutions are equal or superior to the products specified.

- B. No material substitutions will be allowed except by written acceptance from the Consultant. Specified catalog numbers are used for description of equipment and standard of quality only. Equivalent material will be given consideration only if adequate comparison data including samples are provided.
- C. Approval of alternate or substitute equipment or material in no way voids the Specification requirements.
- D. Under no circumstances shall the Owner be required to prove that an item proposed for substitution is not equal to the specified item. It shall be mandatory that the Contractor submit to the Owner or Owner's Representative all evidence to support the contention that the item proposed for substitution is equal to the specified item. The Owner's decision as to the equality of substitution shall be final and without further recourse.

#### **1.10 WARRANTY, MAINTENANCE AND SERVICES**

- A. The contractor shall provide a one (1) year warranty, maintenance and service agreement for the complete IP Video Surveillance System from the date of Substantial Completion. During the one year maintenance and service agreement time period, the contractor shall provide the following at no cost to the Owner:
  - 1. Maintain a 24/7 toll free phone number for warranty and service requests. The contractor shall have service facilities near the project site and shall respond to service calls onsite within a four (4) hour period after receipt of a service call. This includes weekends and holidays. The contractor shall provide all equipment, material and personnel necessary to perform all repairs.
  - 2. Replace all failed components installed as part of the IP video surveillance project. This includes cameras, housings, mounts, supports, CAT 6 cabling and connectors, fiber optic cabling and connectors, 120VAC to 24VAC power supplies, surge protectors, Ethernet extenders, etc. Where extra stock items are used to replace failed components, the contractor shall replace the extra stock items with new items as quickly as possible. Cameras that are repaired and warranted by the manufacturer may be used to replace extra stock items.
  - 3. Troubleshoot software related problems with the video management system. Contact the video management software manufacturer technical support as necessary to resolve setup and configuration issues.
  - 4. The contractor shall maintain all necessary insurance during the warranty, maintenance and service agreement time period.
  - 5. From the date of Substantial Completion, Reno Veterans Administration (Reno VA) will be named "Owner" or "End-User" of the video management software. All communications relating to licensing renewal and technical support will be provided to RENO VA. Any custom configuration or programming of the video management system including rules, alerts, analytics, etc will become the property of RENO VA.

#### **1.11 FINAL ACCEPTANCE**

- A. General
  - 1. All cameras mounted in accordance with the drawings.
  - 2. All cameras connected to the network and assigned IP addresses.
  - 3. All PTZ cameras and housings connected to 24 VAC power.
  - 4. All cameras communicating and recording to the video "Recording" server.
  - 5. All cameras properly aimed and focused for day/night operation.

6. All cameras configured for proper frame rate, video compression, quality and image size.
7. All PTZ cameras configured with "home" positions, presets and preset "tours" as requested by the Owner.
8. Video "Recording" software installed, updated and configured on the video "Recording" servers. Coordinate software installation with RENO VA IT Staff.
9. Client viewing software installed, updated and configured on all computer workstations.
10. Entire video surveillance system tested and commissioned in the presence of the Owner's Representative.
11. All Punchlist items identified during the testing and commissioning corrected to the satisfaction of the Owner's Representative.
12. Operation and Maintenance manuals turned over to the Owner.

## **PART 2 - PRODUCTS**

### **2.1 FIXED DOME INDOOR VANDAL RESISTANT IP VIDEO SURVEILLANCE CAMERAS**

#### **A. General requirements:**

1. Camera shall support three codecs, JPEG, MPEG-4 and H.264, any two of which can be used simultaneously. The camera shall utilize a 1/3-type, CMOS sensor of approx. 1.4 Megapixels and have a day/night capability.
2. Camera shall have an Easy Focus function, which adjusts the camera focus by using the Easy Focus button on the camera unit or remotely via the GUI.
3. Camera shall also have a zoom/focus adjustment capability via the ZOOM/FOCUS switch on the camera unit or remotely via the GUI.
4. The network interface shall be via an 8-pin RJ-45 connector, 10Base-T /100Base-TX Ethernet. Both IPv6 and IPv4 are supported.
5. Camera shall support 1280 x 720 (HD) (default) or 1280 x 1024 (SXGA) resolution.
6. Camera shall support frame rate up to 30 frames per second at 1280 x 720 resolution in any of the three codecs (H.264/MPEG-4/JPEG). The maximum frame rate at 1280 x 1024 resolution shall be 30 frames per second in JPEG, 25 frames per second in MPEG-4 and 20 frames per second in H.264.
7. Constant bit rate algorithm for JPEG data: Camera shall be capable of equalizing JPEG data sizes to have stable bandwidth utilization.
8. The camera shall incorporate a built-in web server, such that the standard web browser Microsoft® Internet Explorer (version 6.0, 7.0 or 8.0 recommended) can be used to access the camera without need for special viewer software.
9. The following web browsers can also be used to access the camera with the 'Plug-in Free' viewer: Firefox version 3.5, Safari version 4.0 and Google Chrome version 4.0. When using these browsers, the video is displayed in JPEG format.
10. The 'Plug-in Free' viewer also supports the Flash plug-in and ActiveX viewer, the latter allowing for MPEG-4 and H.264 video streams.
11. Camera shall support ActiveX viewer which allows the camera image to be viewed in Internet Explorer. The ActiveX viewer allows for recording of video and audio directly to the PC's hard drive, and supports direct audio from the PC mic to the camera.
12. Camera shall be capable of generating HTML code for the video image, allowing for easy web page integration.

13. Camera shall support Windows Vista Sidebar Gadgets and shall allow for the ActiveX viewer to be modified.
14. Camera web browser shall support the following languages: English, Japanese, Simplified Chinese, French, Spanish, German, and Italian.
15. Camera shall be capable of supporting up to ten (10) users simultaneously over the network. Camera shall have up to six user level settings. The administrator shall have complete access/control of the cameras. The other five levels of access can be set to limit user privileges to functions such as viewing, changing image size, etc.
16. Camera shall have the capability to stream MPEG-4 and H.264 video in TCP protocol or MPEG-4 and H.264 in UDP (unicast/multicast) protocol.
17. Camera shall have an Adaptive Rate Control (ARC) function when using MPEG-4 and H.264 compression. This function when enabled, shall allow the camera to maintain the frame rate at a reduced image quality when network congestion occurs. Should network bandwidth become further restricted, the frame rate shall then drop automatically to a suitable speed to maintain image integrity.
18. Camera shall incorporate a built-in Intelligent Motion Detection (IMD) capability. To minimize false triggers, Camera IMD shall compare the current image with prior 15 frames within the camera. The IMD algorithm shall allow the camera to discriminate against some environmental noise such as shaking leaves or AGC noise.
19. The camera shall incorporate technology whereby the IMD function can be used with built-in Video Motion Filters (VMF) to trigger alarms based on rules. The camera shall have the following five VMFs, all of which can be set from the camera setup menu:
  - a. Appearance filter: detects objects that match the detection criteria for objects entering into a user defined area.
  - b. Disappearance filter: detects objects that match the detection criteria for objects exiting a predefined area.
  - c. Existing filter (Loitering filter): detects an object that stays within a defined area longer than the set limit.
  - d. Capacity filter: triggers an alert when the number of detected objects meets or exceeds the detection criteria for object number within the configured area.
  - e. Passing filter or virtual borders: detects objects crossing the set virtual borderline, going in either direction or a specified direction.
20. Camera shall have an audio detection function, which detects loud sounds via an external microphone to trigger alarms or camera actions. Camera shall compare the detected sound with the threshold learned from ambient noise and the frequency to minimize false triggers. The sensitivity settings shall be Low, High and Manual (1 to 100).
21. Camera shall have a camera tampering detection function that alerts the operator if the camera is tampered with. Tampering can include spraying the camera lens, covering it with a cloth, or changing the mounting direction.
22. Camera shall be capable of electronic pan/tilt/zoom, or so called 'Solid PTZ'.
23. Camera shall be capable of predefining up to eight PTZ positions when the Solid PTZ function is enabled.

24. Camera shall be capable of guard tour (position tour), for which up to sixteen (16) presets can be programmed when the Solid PTZ function is enabled. Up to five programs (tours) can be set.
25. Camera shall be capable of image cropping in all codecs, such that only the area of interest is transmitted, to reduce bandwidth and file storage requirements.
26. Camera shall support the following network protocols: TCP, IPv4, IPv6, DNS, RTP/RTCP, RTSP, UDP, ARP, HTTP, HTTPS, ICMP, IGMPv3, SMTP, FTPs, FTPc, DHCP, NTP and SNMP (MIB-2). Network security shall be via Password (basic authentication) and IP filtering.
27. Camera shall support RTSP protocol based upon RFC 2326 and shall support the following options: Describe, Setup, Play, Teardown and Get-Parameter.
28. Camera shall be capable of deterring brute force attacks. The camera shall recognize a brute force attack and refuse HTTP requests from an attacker's IP address for a preconfigured number of seconds. The camera shall determine that a brute force attack occurred when a client authentication error occurs five consecutive times.
29. Camera shall support QoS technology using DSCP (Differentiated Services Code Point).
30. Camera shall support HTTPS client authentication.
31. Camera shall support 802.1X.
32. Camera shall be compliant with the ONVIF (Open Network Video Interface Forum) specification.
33. Camera shall have user configurable port settings.
34. Camera shall be capable of dynamic IP address change notification. It shall accomplish this via an email to a specified address or by HTTP when its IP address changes.
35. Camera shall have an email (SMTP) notification capability which allows the following:
  36. Sending an email to pre-specified users when an alarm is triggered by either motion detection, VMFs, camera tampering detection, audio detection or sensor input. A JPEG image, which is linked with the alarm trigger, can be attached to the email.
  37. Periodically capturing a JPEG image and sending it via email.
38. Camera shall have an integral 2.9X (3.1 to 8.9 mm) F1.2 to F2.1, IR compensated DC auto-iris type vari-focal lens. Camera shall also have 4X digital zoom capability.
39. Camera shall be Power over Ethernet (PoE) capable, compliant to the IEEE 802.3af standard.
40. Camera shall have privacy zone masking which blocks out unwanted or prohibited area within the video image to protect privacy.
41. Camera shall have the capability to display a wide variety of overlays in any of seven positions on the video image (four corners, top, bottom, or center of the image).
42. The minimum electronic shutter setting shall be 1 second, and a maximum of 1/10,000 sec.
43. Camera shall have a 6-pin I/O interface on the camera unit that is accessible via a supplied pigtail. There shall be an alarm input port, and two alarm/relay output ports. The alarm input port shall be opto-isolated.
44. Camera shall support IP Filtering, whereby access to the camera can be restricted to one or more groups of selected users. Up to ten

- (10) different groups can be established by defining an IP address range for each group.
45. Camera shall be capable of limiting the bandwidth from 64 kbps to 8 Mbps in MPEG-4 or H.264, and from 0.5 Mbps to an unlimited bandwidth in JPEG.
  46. Camera shall have an internal image memory size of approx. 8 MB for buffering JPEG/MPEG-4/H.264 images and audio.
  47. Camera shall be capable of pre- and post-alarm buffering.
    - a. The pre-/post-alarm recording capabilities using an 'Image memory' function shall be as follows:
    - b. Capable of storing several seconds of pre-alarm and post-alarm images when an alarm is triggered by the motion detection, VMFs, camera tampering detection, audio detection or sensor input.
    - c. Capable of recording image and sound files on the approx. 8 MB of built-in memory or transferring the files to an FTP server.
    - d. Record in the codec format selected for monitoring.
    - e. Have a maximum duration for pre- and post-alarm recording that shall be dependent on the bit rate setting (for MPEG-4/ H.264) or the picture quality and frame rate setting (for JPEG).
  48. Camera shall support IEEE-802.1X authentication, and shall:
    - a. comply with the IEEE-802.1X standards,
    - b. be capable of being integrated into an IEEE-802.1X network to achieve high network security,
    - c. support EAP-TLS mode to use a key pair from a Certificate Authority (CA),
    - d. support EAP-MD5 mode,
    - e. support PEAP mode.
  49. Upon CGI command request, system log shall be recorded on a built-in flash memory (non volatile memory).
- B. Camera Lens Specifications:
1. Camera shall have an integrated 2.9X IR compensated DC auto-iris type vari-focal lens. Camera shall also have 4X digital zoom capability.
  2. Focal length shall be 3.1 to 8.9 mm with field of view coverage of 85.4° to 31.2°.
  3. The aperture range for the lens shall be F1.2 to F2.1.
- C. Video-electrical requirements:
1. Camera input power shall be a power voltage of either AC 24V, DC 12V, or PoE (802.3af compliant).
  2. The power connection shall be by means 2-pin Phoenix connector on a pig tail, for AC 24V and DC 12V operation.
  3. Camera shall have a composite analog video output in addition to streaming video via Ethernet. The composite analog video output can be used for monitoring while installing the camera to adjust the field of view and focus.
  4. The analog video output of Camera shall be selectable from either the NTSC or PAL standards.
  5. Horizontal resolution shall be 600 TV lines when the camera is in 1280 x 1024 mode (5:4 aspect ratio).
  6. Camera shall require a minimum scene illumination of: 0.20 lx in color and 0.10 lx in B/W (F1.2, 50IRE [IP], View-DR Off, VE Off, AGC High, XDNR Middle) at either 1280 x 720 or 1280 x 1024 resolution.
  7. Camera synchronization shall be Internal.
  8. Camera shall have following AGC levels: Low, Middle, High and OFF, which can be set from the settings menu.

9. The composite video output shall be 1.0 V peak-to-peak @ 75 ohms.
10. The video signal-to-noise ratio shall be more than 50 dB (AGC Off, Weight On).
11. White balance shall be ATW (approx. 2000 K to 10000 K), ATW-PRO (approx. 3000 K to 5800 K), Fluorescent lamp, Mercury lamp, Sodium Vapor lamp, Metal Halide lamp, White LED, One push WB, or Manual.
12. Power consumption shall be 8.0 watts maximum.

D. Audio requirements:

1. Camera shall support bi-directional audio, using G.711 (64kbps) and G.726 (40, 32, 24, 16 kbps) codecs.
2. Camera shall have mini-jack connectors accessible via pigtail (supplied) to support external microphone and active speakers. Mic/line input shall be switchable. Mic input shall be monaural, 2.2 kilo ohms, 2.5V DC plug-in-power, line input shall be monaural, and active speaker output shall have a maximum output level of 1 Vrms.
3. Camera shall be capable of storing up to three audio files. Audio files shall be generated and transferred to the camera using either the web browser or the manufacturer provided audio upload tool software.
4. Camera shall support the Voice alert function, which can automatically play an audio file stored on the camera by an alarm trigger using motion detection, DEPA Advanced VMFs, camera tampering detection, audio detection or via a sensor input.
5. Camera shall have the following audio enhancement capabilities: Dynamic Range Compressor which automatically controls microphone gain to optimize audio volume level, Echo Cancellor, and Ambient Sound Filter to suppress constant ambient noise.
6. Camera shall provide time stamp on the streaming audio. Time stamp shall be inserted in the header area of the audio data.
7. Audio data shall be interleaved with video and serially transmitted in a single session for synchronization.
8. User shall have the capability to activate the microphone input via the web interface.

E. Mechanical requirements:

1. Camera lens/CMOS sensor combination shall be a ball-joint type for easy pan, tilt and rotation adjustments, without need for special tools. This ball-joint mechanism shall be capable of being locked in place with the lock screw on the base of the ball-joint mechanism. The rotation and pan ranges shall be +/-180 degrees and the tilt range shall be 0 to 70 degrees.
2. Camera lens shall be an integrated 3.1 to 8.9 mm F1.2 to F2.1, IR compensated DC auto-iris type vari-focal lens.
3. Camera shall have an aluminum die-cast casing and a polycarbonate dome cover.
4. Sensor inputs and relay outputs shall be via a pigtail cable (supplied).
5. The camera shall support one optically isolated sensor input, and two relay outputs.
6. Camera shall provide sensor in/relay out ports for interfacing with external equipment. The sensor input shall be configurable for either 'Normally Open' or 'Normally Closed' configuration.
7. Two relay outputs shall be rated at 24V AC/24V DC, 1 Amp or less.
8. Analog video output shall be a BNC type connector accessible via pigtail cable (supplied).

9. A secondary analog monitor output shall be provided, accessible from the front of the camera unit after the camera is installed. The interface shall be an RCA connector.
10. Camera dimensions shall be approximately 5 5/8 inches (Dia.) x 4 3/4 inches (H), 140 mm (Dia.) x 119 mm (H).
11. Camera shall weigh approximately 2 lb 3 oz (980 grams) (not including cables and a bracket).
12. Camera shall have an RJ-45 socket accessible via pigtail.
13. Camera shall be capable of being flush mounted to a ceiling using an optional Flush mount kit YT-ICB45 or YT-ICB140, available from the camera manufacturer.
14. Camera shall have an Easy Focus button on the front of the camera unit, which is used to adjust the camera focus.
15. Camera shall also have a ZOOM/FOCUS switch on the front of the camera unit, which is used for manual adjustments of the camera zoom and focus.
16. Camera shall have a conduit opening for wiring when the camera is wall or ceiling mounted.
17. Camera shall be IK10 rated in accordance with the IEC 62262 standard.

F. Environmental requirements:

1. Camera operating temperature shall be within the range of 14°F to 122°F (-10°C to +50°C). Cold start temperature must be greater than 32°F (0°C).
2. Camera operating humidity shall be within the range of 20% to 80% (non-condensing).

G. Acceptable Indoor Vandal Resistant Dome Cameras:

1. Panasonic WV-SF346 (To match existing VA standards and to be compatible with existing Panasonic NVR's).
2. No substitutions Accepted.

**2.2 FIXED DOME OUTDOOR VANDAL RESISTANT IP VIDEO SURVEILLANCE CAMERAS**

A. General Requirements:

1. Camera shall be an HD minidome network camera supporting three codecs, JPEG, MPEG-4 and H.264, any two of which can be used simultaneously. Camera shall utilize a 1/3-type, CMOS sensor of approx. 1.4 Megapixels and have a day/night capability.
2. Camera shall have built-in IR illuminators which allow for capturing images in the complete darkness (0 lx). The camera shall have two modes: 'Sync with Day/Night' and 'off'. When 'Sync with Day/Night' mode is selected, IR illuminators are automatically activated when the camera switches to night mode. There shall be six selectable 'Maximum Strength' levels to control the intensity of the IR illuminators.
3. The IR illuminators shall have a wavelength of 850 nm.
4. The IR illuminators shall be effective (50IRE [IP]) at 30 m (98.4 ft) when the camera is set as follows: View-DR Off, VE Off, AGC High, XDNR Middle.
5. Camera shall have an Easy Focus function, which adjusts the camera focus by using the Easy Focus button on the camera unit or remotely via the GUI. When the camera is switched between day and night modes, the Easy Focus function is automatically activated to keep the camera focused.
6. Camera shall also have a zoom/focus adjustment capability via the ZOOM/FOCUS switch on the camera unit or remotely via the GUI.

7. The network interface shall be via an 8-pin RJ-45 connector, 10Base-T /100Base-TX Ethernet. Both IPv6 and IPv4 are supported.
8. Camera shall utilize JPEG, MPEG-4 and H.264 compression. There are two 'resolution' modes to choose from when installing a camera: 1280 x 720 (HD) (default) or 1280 x 1024 (SXGA).
9. When 1280 x 720 mode (aspect ratio: 16:9) is selected, and resolutions in 4:3 aspect ratio are chosen, the displayed image will be stretched vertically. When 1280 x 1024 mode (aspect ratio: 5:4) is selected, and resolutions in 16:9 aspect ratio are chosen, the displayed image will be stretched horizontally.
10. The maximum frame rate capability of Camera over LAN shall be 30 frames per second at 1280 x 720 resolution in any of the three codecs (H.264/MPEG-4/JPEG). The maximum frame rate at 1280 x 1024 resolution shall be 30 frames per second in JPEG, 25 frames per second in MPEG-4 and 20 frames per second in H.264.
11. Camera shall have the capability of simultaneously encoding up to two of the following codecs in any combination: JPEG, MPEG-4, and/or H.264
12. JPEG compression levels shall be user selectable in ten (10) levels of compression ratios, based on an image of 24bits per picture element (8bits each for YUV).
13. Constant bit rate algorithm for JPEG data: Camera shall be capable of equalizing JPEG data sizes to have stable bandwidth utilization.
14. Camera shall have an analog video output producing 600 TV lines of horizontal resolution when the camera is in 1280 x 1024 mode (5:4 aspect ratio).
15. The supported operating systems shall be Microsoft Windows 7™ 32bit (Ultimate/Professional), Windows Vista® 32bit (Ultimate/Business), Windows® XP 32bit (Professional), and DirectX® 9.0c or higher. Minimum PC requirements shall be the Intel Core®2 Duo Processor, 2 GHz or higher, with 1GB RAM or more supporting 1600 x 1200 or higher resolution, 24-bit True Color display capability with Ethernet 100Base-TX.
16. Camera shall incorporate a built-in web server, such that the standard web browser Microsoft® Internet Explorer (version 6.0, 7.0 or 8.0 recommended) can be used to access the camera without need for special viewer software.
17. The following web browsers can also be used to access the camera with the 'Plug-in Free' viewer: Firefox version 3.5, Safari version 4.0 and Google Chrome version 4.0. When using these browsers, the video is displayed in JPEG format.
18. The 'Plug-in Free' viewer also supports the Flash plug-in and ActiveX viewer, the latter allowing for MPEG-4 and H.264 video streams.
19. Camera shall support ActiveX viewer which allows the camera image to be viewed in Internet Explorer. The ActiveX viewer allows for recording of video and audio directly to the PC's hard drive, and supports direct audio from the PC mic to the camera.
20. Camera shall be capable of generating HTML code for the video image, allowing for easy web page integration.
21. Camera web browser shall support the following languages: English.
22. Camera shall be capable of supporting up to ten (10) users simultaneously over the network.
23. Camera shall have up to six user level settings. The administrator shall have complete access/control of the cameras. The other five

- levels of access can be set to limit user privileges to functions such as viewing, changing image size, etc.
24. Camera shall have the capability to stream MPEG-4 and H.264 video in TCP protocol or MPEG-4 and H.264 in UDP (unicast/multicast) protocol.
  25. Camera shall have an Adaptive Rate Control (ARC) function when using MPEG-4 and H.264 compression. This function when enabled, shall allow the camera to maintain the frame rate at a reduced image quality when network congestion occurs. Should network bandwidth become further restricted, the frame rate shall then drop automatically to a suitable speed to maintain image integrity.
  26. Camera shall incorporate a built-in Intelligent Motion Detection (IMD) capability. To minimize false triggers, Camera IMD shall compare the current image with prior 15 frames within the camera. The IMD algorithm shall allow the camera to discriminate against some environmental noise such as shaking leaves or AGC noise.
  27. The camera shall incorporate technology whereby the IMD function can be used with built-in Video Motion Filters (VMF) to trigger alarms based on rules. The camera shall have the following five VMFs, all of which can be set from the camera setup menu:
    - a. Appearance filter: detects objects that match the detection criteria for objects entering into a user defined area.
    - b. Disappearance filter: detects objects that match the detection criteria for objects exiting a predefined area.
    - c. Existing filter (Loitering filter): detects an object that stays within a defined area longer than the set limit.
    - d. Capacity filter: triggers an alert when the number of detected objects meets or exceeds the detection criteria for object number within the configured area.
    - e. Passing filter or virtual borders: detects objects crossing the set virtual borderline, going in either direction or a specified direction.
  28. Camera shall have an audio detection function, which detects loud sounds via an external microphone to trigger alarms or camera actions. Camera shall compare the detected sound with the threshold learned from ambient noise and the frequency to minimize false triggers. The sensitivity settings shall be Low, High and Manual (1 to 100).
  29. Camera shall have a camera tampering detection function that alerts the operator if the camera is tampered with. Tampering can include spraying the camera lens, covering it with a cloth, or changing the mounting direction.
  30. Camera shall be capable of electronic pan/tilt/zoom, or so called 'Solid PTZ'.
  31. Camera shall be capable of predefining up to eight PTZ positions when the Solid PTZ function is enabled.
  32. Camera shall be capable of guard tour (position tour), for which up to sixteen (16) presets can be programmed when the Solid PTZ function is enabled. Up to five programs (tours) can be set.
  33. Camera shall be capable of image cropping in all codecs, such that only the area of interest is transmitted, to reduce bandwidth and file storage requirement.
  34. Camera shall support the following network protocols: TCP, IPv4, IPv6, DNS, RTP/RTCP, RTSP, UDP, ARP, HTTP, HTTPS, ICMP, IGMPv3,

- SMTP, FTPs, FTPc, DHCP, NTP and SNMP (MIB-2). Network security shall be via Password (basic authentication) and IP filtering.
35. Camera shall support RTSP protocol based upon RFC 2326 and shall support the following options: Describe, Setup, Play, Teardown and Get-Parameter.
  36. Camera shall be capable of deterring brute force attacks. The camera shall recognize a brute force attack and refuse HTTP requests from an attacker's IP address for a preconfigured number of seconds. The camera shall determine that a brute force attack occurred when a client authentication error occurs five consecutive times.
  37. Camera shall support QoS technology using DSCP (Differentiated Services Code Point).
  38. Camera shall support HTTPS client authentication.
  39. Camera shall support 802.1X.
  40. Camera shall be compliant with the ONVIF (Open Network Video Interface Forum) specification.
  41. Camera shall have user configurable port settings.
  42. Camera shall be capable of dynamic IP address change notification. It shall accomplish this via an email to a specified address or by HTTP when its IP address changes.
  43. Camera shall have an email (SMTP) notification capability which allows the following:
    - a. Sending an email to pre-specified users when an alarm is triggered by either motion detection, VMFs, camera tampering detection, audio detection or sensor input. A JPEG image, which is linked with the alarm trigger, can be attached to the email.
    - b. Periodically capturing a JPEG image and sending it via email.
  44. Camera shall have an integral 2.9X (3.1 to 8.9 mm) F1.2 to F2.1, IR compensated DC auto-iris type vari-focal lens. Camera shall also have 4X digital zoom capability.
  45. Camera shall be Power over Ethernet (PoE) capable, compliant to the IEEE 802.3af standard.
  46. Camera shall be equipped with a built-in heater that is automatically activated when the internal temperature drops below a predefined threshold. The built-in heater is operational when the unit is powered by AC 24V or DC 12V.
  47. Camera shall have privacy zone masking which blocks out unwanted or prohibited area within the video image to protect privacy. Mask colors shall be Black, any of six (6) shades of Gray, White, Green, Yellow, Red, Cyan, Magenta, and Blue. The camera shall be capable of masking up to eight (8) areas. Such capability shall be via vendor supplied toolbox utility software or the browser-based setup menu.
  48. The vendor toolbox software shall include IP Setup (including group camera management) program, Firmware Upgrade Tool, Privacy Masking Tool, Custom Homepage Installer, and Group Camera Setting Scheduler. The toolbox software shall be supplied with the camera as a standard accessory in the CD-ROM.
  49. Camera shall have the capability to display a wide variety of overlays in any of seven positions on the video image (four corners, top, bottom, or center of the image). The following overlays shall be possible:
  50. The minimum electronic shutter setting shall be 1 second, and a maximum of 1/10,000 sec.
  51. Camera shall have a 6-pin I/O interface on the camera unit that is accessible via a supplied pigtail. There shall be an alarm input

- port, and two alarm/relay output ports. The alarm input port shall be opto-isolated.
52. Camera shall support IP Filtering, whereby access to the camera can be restricted to one or more groups of selected users. Up to ten (10) different groups can be established by defining an IP address range for each group.
  53. Camera shall be capable of limiting the bandwidth from 64 kbps to 8 Mbps in MPEG-4 or H.264, and from 0.5 Mbps to an unlimited bandwidth in JPEG.
  54. Camera shall have an internal image memory size of approx. 8 MB for buffering JPEG/MPEG-4/H.264 images and audio.
  55. Camera shall be capable of pre- and post-alarm buffering.
  56. The pre-/post-alarm recording capabilities using an 'Image memory' function shall be as follows:
    - a. Capable of storing several seconds of pre-alarm and post-alarm images when an alarm is triggered by the motion detection, VMFs, camera tampering detection, audio detection or sensor input.
    - b. Capable of recording image and sound files on the approx. 8 MB of built-in memory or transferring the files to an FTP server.
    - c. Record in the codec format selected for monitoring.
  57. Have a maximum duration for pre- and post-alarm recording that shall be dependent on the bit rate setting (for MPEG-4/ H.264) or the picture quality and frame rate setting (for JPEG).
  58. Camera shall support IEEE-802.1X authentication, and shall:
    - a. comply with the IEEE-802.1X standards,
    - b. be capable of being integrated into an IEEE-802.1X network to achieve high network security,
    - c. support EAP-TLS mode to use a key pair from a Certificate Authority (CA),
    - d. support EAP-MD5 mode,
    - e. support PEAP mode.
  59. Upon CGI command request, system log shall be recorded on a built-in flash memory (non volatile memory).
- B. Camera Lens Specifications:
1. Camera shall have an integrated 2.9X IR compensated DC auto-iris type vari-focal lens. Camera shall also have 4X digital zoom capability.
  2. Focal length shall be 3.1 to 8.9 mm with field of view coverage of 85.4° to 31.2°.
  3. The aperture range for the lens shall be F1.2 to F2.1.
- C. VIDEO-ELECTRICAL REQUIREMENTS:
1. Camera input power shall be a power voltage of either AC 24V, DC 12V, or PoE (802.3af compliant).
  2. The power connection shall be by means 2-pin Phoenix connector on a pig tail, for AC 24V and DC 12V operation.
  3. Camera shall have a composite analog video output in addition to streaming video via Ethernet. The composite analog video output can be used for monitoring while installing the camera to adjust the field of view and focus.
  4. The analog video output of Camera shall be selectable from either the NTSC or PAL standards.
  5. Horizontal resolution shall be 600 TV lines when the camera is in 1280 x 1024 mode (5:4 aspect ratio).
  6. Camera shall require a minimum scene illumination of: 0.20 lx in color (F1.2, 50IRE [IP], View-DR Off, VE Off, AGC High, XDNR Middle)

and 0 lx in B/W (F1.2, 50IRE [IP], View-DR Off, VE Off, AGC High, XDNR Middle, IR illuminators On), at either 1280 x 720 or 1280 x 1024 resolution.

7. Camera synchronization shall be Internal.
8. Camera shall have following AGC levels: Low, Middle, High and OFF, which can be set from the settings menu.
9. The composite video output shall be 1.0 V peak-to-peak @ 75 ohms.
10. The video signal-to-noise ratio shall be more than 50 dB (AGC Off, Weight On).
11. White balance shall be ATW (approx. 2000 K to 10000 K), ATW-PRO (approx. 3000 K to 5800 K), Fluorescent lamp, Mercury lamp, Sodium Vapor lamp, Metal Halide lamp, White LED, One push WB, or Manual.
12. Power consumption for Camera shall be 28 watts maximum.

D. AUDIO REQUIREMENTS:

1. Camera shall support bi-directional audio, using G.711 (64kbps) and G.726 (40, 32, 24, 16 kbps) codecs.
2. Camera shall have mini-jack connectors accessible via pigtail (supplied) to support external microphone and active speakers. Mic/line input shall be switchable. Mic input shall be monaural, 2.2 kilo ohms, 2.5V DC plug-in-power, line input shall be monaural, and active speaker output shall have a maximum output level of 1 Vrms.
3. Camera shall be capable of storing up to three audio files. Audio files shall be generated and transferred to the camera using either the web browser or the manufacturer provided audio upload tool software.
4. Camera shall support the Voice alert function, which can automatically play an audio file stored on the camera by an alarm trigger using motion detection, DEPA Advanced VMFs, camera tampering detection, audio detection or via a sensor input.
5. Camera shall have the following audio enhancement capabilities: Dynamic Range Compressor which automatically controls microphone gain to optimize audio volume level, Echo Canceller and Ambient Sound Filter to suppress constant ambient noise.
6. Camera shall provide time stamp on the streaming audio. Time stamp shall be inserted in the header area of the audio data.
7. Audio data shall be interleaved with video and serially transmitted in a single session for synchronization.
8. User shall have the capability to activate the microphone input via the web interface.

E. MECHANICAL REQUIREMENTS:

1. Camera lens/CMOS sensor combination shall be a ball-joint type for easy pan, tilt and rotation adjustments, without need for special tools. This ball-joint mechanism shall be capable of being locked in place with the lock screw on the base of the ball-joint mechanism. The rotation and pan ranges shall be +/-180 degrees and the tilt range shall be 0 to 70 degrees.
2. Camera lens shall be an integrated 3.1 to 8.9 mm F1.2 to F2.1, IR compensated DC auto-iris type vari-focal lens.
3. Camera shall have built-in IR illuminators.
4. Camera shall have an aluminum die-cast casing, a polycarbonate dome cover, and a built-in heater.
5. Sensor inputs and relay outputs shall be via a pigtail cable (supplied).
6. The camera shall support one optically isolated sensor input, and two relay outputs.

7. Camera shall provide sensor in/relay out ports for interfacing with external equipment. The sensor input shall be configurable for either 'Normally Open' or 'Normally Closed' configuration.
8. Two relay outputs shall be rated at 24V AC/24V DC, 1 Amp or less.
9. Analog video output from Camera shall be a BNC type connector accessible via pigtail cable (supplied).
10. A secondary analog monitor output shall be provided, accessible from the front of the camera unit after Camera is installed. The interface shall be an RCA connector.
11. Camera dimensions shall be approximately 6 5/8 inches (Dia.) x 4 3/4 inches (H), 166 mm (Dia.) x 119 mm (H).
12. Camera shall weigh approximately 3 lb 1 oz (1.38 kg) (not including cables and a bracket).
13. For safety, the removable front dome casing shall be secured via a rubber-based material secured through a strap to the main camera body.
14. Camera shall have an RJ-45 socket accessible via pigtail.
15. Camera shall be capable of being flush mounted to a ceiling using an optional Flush mount kit YT-ICB45, available from the camera manufacturer.
16. Camera shall have an Easy Focus button on the front of the camera unit, which is used to adjust the camera focus.
17. Camera shall also have a ZOOM/FOCUS switch on the front of the camera unit, which is used for manual adjustments of the camera zoom and focus.
18. Camera shall have a 3/4" conduit opening on both the bottom and side of the unit to help prevent water ingress around the cabling.
19. Camera shall be IP66 rated in accordance with the IEC 60529 standard and IK10 rated in accordance with the IEC 62262 standard.

**F. ENVIRONMENTAL REQUIREMENTS:**

1. Camera operating temperature shall be:
  - a. When the unit is powered by AC 24V or DC 12V, within the range of -22°F to +122°F (-30°C to +50°C). Cold start temperature must be greater than -4°F (-20°C).
  - b. When the unit is powered by PoE system, within the range of 14°F to +122°F (-10°C to +50°C). Cold start temperature must be greater than 32°F (0°C).
2. Camera operating humidity shall be within the range of 20% to 80% (non-condensing).
3. Camera shall have a built-in heater allowing the camera to operate in extremely cold environments as low as -22°F (-30°C) when the unit is powered by AC 24V or DC 12V.

**G. Acceptable Fixed Outdoor Dome Cameras with IR Illuminators:**

1. Panasonic WV-SW355 w/heater WV-SW3H (to match existing VA standards and to be compatible with existing Panasonic NVR's).
2. No substitutions accepted.

**2.3 SURFACE MOUNTED VANDAL RESISTANT PAN, TILT, ZOOM (PTZ) CAMERAS**

**A. General Requirements:**

1. Camera shall be a network enabled, JPEG, MPEG-4 and H.264 Triple Codec, PTZ, day/night, HD Rapid Dome camera, utilizing an 1/3-type, HD CMOS sensor of approx. 2 Megapixels.
2. Camera shall be capable of 360 degree pan rotation and a tilt range of 210 degrees, designed for ceiling mount operation.
3. Camera shall incorporate a built-in 10X optical, auto-focus zoom lens, and shall have 12X digital zoom capability.

4. Camera shall be capable of an e-flip function, a feature when the camera passes the down position, electronically flips the image 180 degrees.
5. Camera shall be capable of guard tour, which can be used to program up to sixteen (16) presets and moves to each preset sequentially when guard tour is activated.
6. Camera shall be capable of shadow tour, which is used to learn an operator's PTZ control actions (including those made with a joystick) and then repeats the motions on command.
7. Camera shall have an analog video output producing 480 TV lines of horizontal resolution.
8. Network interface shall be via an 8-pin RJ-45 connector, 10Base-T/100Base-TX Ethernet. Both IPv6 and IPv4 are supported.
9. Camera shall utilize JPEG, MPEG-4 and H.264 compression. The maximum resolution for each codec shall be 1280 x 720. JPEG Compression levels shall be user selectable in ten (10) levels of compression ratios, based on an image of 24bits per picture element (8bits each for YUV).
10. Camera shall incorporate a built-in web server, such that the standard web browser Microsoft® Internet Explorer (version 6.0 or 7.0 recommended) can be used to access the camera view without need for special viewer software.
11. Camera shall support ActiveX viewer which allows the camera image to be viewed in Internet Explorer, can display panorama images in 'Map Mode' and 'Arctic View Mode', allows for recording of video and audio directly to the PC's hard drive, and supports direct audio from the PC mic to the camera.
12. Camera shall have a 'Plug-in Free' viewer that allows the camera image to be viewed in JPEG format without using any plug-ins. The 'Plug-in Free' viewer allows HTML code for the video image to be generated, allowing for easy web page integration.
13. The 'Plug-in Free' viewer also supports the Flash plug-in and ActiveX viewer, the latter allowing for MPEG-4 and H.264 video streams.
14. Camera shall support Windows Vista Sidebar Gadgets and shall allow for the ActiveX viewer to be modified.
15. Camera shall be capable of supporting up to ten (10) users simultaneously over the network. Camera shall have up to six user level settings.
16. Maximum frame rate capability of Camera over LAN shall be up to 30 frames per second at 1280 x 720, 1024 x 576, 800 x 480, 768 x 576, 640 x 480, 640 x 360, 384 x 288, 320 x 240 and 320 x 180 resolutions when H.264, MPEG-4 or JPEG compression is selected.
17. Camera shall have the capability of simultaneously encoding up to two of the following codecs in any combination: JPEG, MPEG-4, and/or H.264 including multiple instances of the same codec.
18. Camera shall have the capability to stream JPEG, MPEG-4 and H.264 video in TCP protocol or MPEG-4 and H.264 in UDP (unicast/multicast) protocol.
19. Camera shall have an Adaptive Rate Control (ARC) function when using MPEG-4 and H.264 compression. This function when enabled, shall allow the camera to maintain the frame rate at a reduced image quality when network congestion occurs. Should network bandwidth become further restricted, the frame rate shall then drop automatically to a suitable speed to maintain image integrity.

20. Camera shall incorporate a built-in Intelligent Motion Detection (IMD) capability. To minimize false triggers, Camera IMD shall compare the current image with prior 15 frames within the camera. The IMD algorithm shall allow the camera to discriminate against some environmental noise such as shaking leaves or AGC noise.
21. The camera shall incorporate technology whereby the IMD function can be used with built-in Video Motion Filters (VMF) to trigger alarms based on rules. The camera shall have the following five VMFs, all of which can be set from the camera setup menu:
  - a. Appearance filter: detects objects that match the detection criteria for objects entering into a user defined area.
  - b. Disappearance filter: detects objects that match the detection criteria for objects exiting a predefined area.
  - c. Existing filter (Loitering filter): detects an object that stays within a defined area longer than the set limit.
  - d. Capacity filter: triggers an alert when the number of detected objects meets or exceeds the detection criteria for object number within the configured area.
  - e. Passing filter or virtual borders: detects objects crossing the set virtual borderline, going in either direction or a specified direction.
22. Camera shall have a camera tampering detection function that alerts the operator if the camera is tampered with. Tampering can include spraying the camera lens, covering it with a cloth, or changing the mounting direction.
23. Camera shall be capable of image cropping in all codecs, such that only the area of interest is transmitted, to reduce bandwidth and file storage requirements.
24. Camera shall support the following Network protocols: TCP, IPv4, IPv6, DNS, RTP/RTCP, RTSP, UDP, ARP, HTTP, HTTPS, ICMP, SMTP, FTPs, FTPc, DHCP, NTP and SNMP (MIB2). Network security shall be via Password (basic authentication) and IP filtering.
25. Camera shall support QoS technology using DSCP (Differentiated Services Code Point).
26. Camera shall support HTTPS client authentication.
27. Camera shall support 802.1X.
28. Camera shall be compliant with the ONVIF (Open Network Video Interface Forum) specification.
29. Camera shall have user configurable port settings.
30. Camera shall be capable of dynamic IP address change notification. It shall accomplish this via an email to a specified address or by HTTP when its IP address changes.
31. Camera shall have an integral 10X (5.1 to 51 mm) F1.8 to F2.1, Auto-focus zoom lens.
32. Camera shall have dynamic privacy zone masking which blocks out unwanted or prohibited area within the video image to protect privacy.
33. Camera shall have the capability to display a wide variety of overlays in any of seven positions on the video image (four corners, top, bottom, or center of the image).
34. The minimum electronic shutter setting shall be 1/2 second, and a maximum of 1/10,000 sec.
35. Camera shall have a 9-pin I/O interface that is accessible via a pigtail connected to camera. There shall be four alarm input ports,

- and two Alarm/relay output ports. The Alarm input port shall be opto-isolated.
36. Camera shall have RS-232C, RS-422, and RS-485 interfaces and support the Pelco D and VISCA Protocol.
  37. Camera shall support IP Filtering, whereby access to the camera can be restricted to one or more groups of selected users. Up to ten (10) different groups can be established by defining an IP address range for each group.
  38. Camera access shall be capable of Password Protection. User names and passwords shall be assignable to allow six levels of access.
  39. The administrator shall have complete access/control of the cameras.
  40. The other five levels of access can be set to limit user privileges to functions such as viewing, changing image size, etc.
  41. Camera shall be capable of limiting the bandwidth from 64 kbps to 8 Mbps in MPEG-4 or H.264, and from 0.5 Mbps to an unlimited bandwidth in JPEG.
  42. Camera shall have an internal image memory size of 8MB for alarm buffering.
  43. Camera shall be capable of pre- and post-alarm buffering.
  44. Camera pre-/post-alarm recording capabilities shall be as follows:
    - a. Capable of storing several seconds of pre-alarm and post-alarm images when an alarm is triggered by the motion detection or sensor input.
    - b. Capable of recording image and sound files on the 8 MB of built-in memory or transferring the files to an FTP server.
    - c. Record in the codec format selected for monitoring.
    - d. Have a maximum duration for pre- and post-alarm recording that shall be dependent on the bit rate setting (for MPEG-4/ H.264) or the picture quality and frame rate setting (for JPEG).
  45. Camera shall support IEEE-802.1X authentication, and shall:
    - a. comply with the IEEE-802.1X standards,
    - b. be capable of being integrated into an IEEE-802.1X network to achieve high network security,
    - c. support EAP-TLS mode to use a key pair from a Certificate Authority (CA),
    - d. support EAP-MD5 mode,
    - e. support PEAP mode.
  46. Upon CGI command request, system log shall be recorded on a built-in flash memory (non volatile memory).
- B. Camera Lens Specifications:
1. Camera shall have an integrated 10X Auto-focus zoom lens.
  2. Focal length shall be 5.1 to 51 mm with field of view coverage of 50.0° to 5.4°.
  3. The integral lens shall be an IR compensated type lens.
  4. The aperture range for the lens shall be F1.8 to F2.1.
- C. Video-Electrical Requirements:
1. Camera input power shall be a power voltage of AC 24V.
  2. The power connection shall be by means 3-pin Phoenix connector on a pig tail.
  3. Camera shall have composite analog video output in addition to streaming video via Ethernet.
  4. The video output of Camera shall be selectable from either the NTSC or PAL standards.
  5. Horizontal resolution shall be 480 TV lines.

6. Camera shall require a minimum scene illumination of: 2.1lx(XDNR ON VE ON Slow Shutter OFF 50IRE IP/Analog) in color and 0.19lx(XDNR ON VE ON Slow Shutter OFF 50IRE IP/Analog) in B/W at 1280 x 720 resolution.
  7. Camera synchronization shall be Internal.
  8. Camera shall have an ON/OFF selectable AGC up to 18dB, through the settings menu.
  9. The composite video output shall be 1.0 V peak-to-peak @ 75 ohms.
  10. The video signal-to-noise ratio shall be more than 50dB (AGC OFF).
  11. White balance shall be Auto, Indoor, Outdoor, One push WB, or Manual.
  12. Power consumption for Camera shall be 80 watts maximum.
- D. Audio Requirements:
1. Camera shall support bi-directional audio, using G.711 (64kbps) and G.726 (40, 32, 24, 16 kbps) codecs.
  2. Camera shall have mini-jack connectors accessible via pigtail to support external microphone and active speakers. Mic/line input shall be switchable. Mic input shall be monaural, 2.2 kilo ohms, 2.5V DC plug-in-power, line input shall be monaural, and active speaker output shall have a maximum output level of 1 Vrms.
  3. Camera shall be capable of storing up to three audio files. Audio files shall be generated and transferred to the camera using either the web browser or the manufacturer provided Audio Upload Tool Software.
  4. Camera shall support Voice alert function, which can automatically play an audio file stored on the camera by an alarm trigger using motion detection, DEPA Advanced VMFs, camera tampering detection or via a sensor input.
  5. Camera shall have the following audio enhancement capabilities: Echo Canceller and Ambient Sound Filter to suppress constant ambient noise.
  6. Camera shall provide time stamp on the streaming audio. Time stamp shall be inserted in the header area of the audio data.
  7. Audio data shall be interleaved with video and serially transmitted in a single session for synchronization.
  8. User shall have the capability to activate the microphone input via the web interface.
- E. Mechanical Requirements:
1. Camera shall have 360° endless pan rotation and 210° tilt range. The default tilt setting shall be 180° changeable via web browser or cgi command. The unit shall be designed for ceiling mount operation.
  2. Camera shall have maximum pan/tilt speeds of 400° per second and minimum pan/tilt speeds of 0.1° per second. Camera shall have ten (10) user defined presets, with a repeatable mechanical preset accuracy of ±0.045° (typical).
  3. Camera lens shall be an integrated 5.1 to 51 mm F1.8 to F2.1 Auto-focus zoom lens.
  4. Camera shall have zoom movement speed of approx. 1.0 second (optical wide to optical tele).
  5. Camera shall be IP66 rated.
  6. Camera shall have a magnesium die-cast casing, ventilated AES (Acrylonitrile- Ethylene Styrene) sunshade, a hard coated clear polycarbonate dome, built-in heater, and 5-built-in fans for extensive cooling.
  7. Sensor inputs and relay outputs shall be via a pigtail cable.

8. The camera shall support four optically isolated sensor inputs, and two relay outputs.
  9. Camera shall provide sensor in/relay out ports for interfacing with external equipment. Sensor inputs shall be configurable for either 'Normally Open' or 'Normally Closed' configuration.
  10. Two relay outputs shall be rated at 24V AC/24V DC, 1 Amp or less.
  11. Video output connector from Camera shall be a BNC type connector accessible via pigtail.
  12. Camera shall have a built-in compact flash card slot to allow the use of additional compact flash memory, or allow the use of the manufacturer specified compact flash wireless LAN card.
  13. Camera dimensions shall be approximately 9 3/8 inches (Dia.) x 13 5/8 inches (H), 238 mm (Dia.) x 344 mm (H) (not including projecting parts).
  14. Camera shall weigh approximately 9 lb 8 oz (4.3 kg) (including ceiling unit).
  15. Camera shall be capable of being installed and detached easily using the quick release mechanism. Even if the camera is removed from the base unit, the IP network information shall remain with the base unit.
  16. Camera shall have an RJ-45 socket accessible via pigtail.
- F. Environmental Requirements:
1. Camera operating temperature shall be within the range of -40°F to 122°F (-40°C to +50°C).
  2. Camera operating humidity shall be within the range of 10% to 90% (non-condensing).
  3. Camera shall have a built-in heater unit allowing the camera to operate in extremely cold environments as low as 40°F (-40°C).
- G. Acceptable Surface Mounted Vandal Resistant PTZ Cameras:
1. Panasonic WV-SW396 (to match existing VA standards and to be compatible with existing Panasonic NVR's ).
  2. No substitutions accepted.

#### **2.4 EXTERIOR WALL MOUNT GOOSENECK SUPPORT BRACKETS AND SHROUD**

- A. Provide wall support gooseneck brackets where shown on the drawings and referenced in the camera schedule to support outdoor wall mounted fixed dome and PTZ cameras.
- B. Wall support gooseneck brackets shall be compatible with the manufacturer's camera.
- C. General Requirements
  1. Mount brackets shall have a 1.5" NPT threads to support cameras.
  2. Mount brackets shall have a camera shroud to attach fixed dome cameras.
  3. Mount brackets shall have a mounting plate to connect to a vertical wall surface.
  4. Mount brackets shall be color white.
- D. Acceptable Products
  1. Panasonic PWM20GS with dome mounting shroud (to be compatible with existing VA standards).
  2. No substitutions accepted.

#### **2.5 FIXED DOME CAMERA CEILING MOUNT BRACKET AND TRIM RING**

- A. Provide ceiling mount brackets and trim ring where shown on the drawings and referenced in the camera schedule to flush mount dome cameras.
- B. Brackets shall be compatible with the manufacturer's camera.
- C. General Requirements:

1. Mount brackets shall securely fasten the dome camera to the ceiling structure.
2. Mount brackets will allow the camera dome lens to protrude through the ceiling structure.
3. A white trim ring shall be provided for installation below the ceiling.

D. Acceptable Products

1. Panasonic PRCM1 (to be compatible with existing VA standards).
2. No substitutions accepted.

**2.6 CORNER MOUNT BRACKET**

A. Provide corner mount brackets where shown on the drawings to mount exterior cameras on outside wall corners.

B. General Requirements

1. Corner mounts shall securely fasten gooseneck supports to the exterior wall.
2. Brackets shall fastened to the exterior wall with qty (4) fasteners.
3. Corner mount brackets shall be color white.

C. Acceptable Products

1. Panasonic PACA2(to be compatible with existing VA standards).
2. No substitutions accepted.

**2.7 NEMA 4 ENCLOSURES FOR EXTERIOR WALL MOUNTED CAMERAS**

A. General Requirements:

1. Provide NEMA 4 enclosures to mount exterior cameras where shown on the drawings.
2. NEMA 4 enclosures shall be cast aluminum with a continuous hinge door.
3. Enclosures shall have a bolt hole pattern on the front to accommodate the gooseneck supports.
4. Paint enclosure to match existing surface.

B. Acceptable Products.

1. Videolarm PB-24 (Box Only).
2. Or Approved Equal.

**2.8 NETWORK VIDEO RECORDERS**

A. General Requirements:

1. Provide network video recorder(s) to record video streams from IP based surveillance cameras.
2. Video recorders shall be rack mountable. Provide rack mounting kit with each recorder.
3. Video Recorders shall be compatible with the IP surveillance cameras.
4. Video recorders shall have a minimum of qty (2) 10/100Mbps Ethernet ports.
5. Video recorders shall have internal hard drive disk space to store a minimum of 10TB of data.
6. Hard disk drives shall be configured in a RAID 5 configuration.
7. Video recorders shall have processing power to record video streams from all of the cameras shown on the drawings. Video streams shall be 1,280 x 960 pixels, H.264 compression, 10 frames per second with a constant bit rate set to 3Mbit/sec.
8. Acceptable Products:
  - a. Panasonic WJ-ND400/10000 2T.
  - b. No substitutions accepted.

**2.9 CAMERA WORKSTATION SOFTWARE**

A. Provide video monitoring software enable a single workstation to view cameras.

B. Acceptable Products:

1. Panasonic WV-ASM200 (to match existing VA standards).
2. No substitutions accepted.

**2.10120VAC TO 24VAC 16-OUTPUT RACK MOUNTED POWER SUPPLIES**

A. Provide 120vac to 24vac rack mounted power supplies where shown on the rack elevations. Power supplies shall meet the following physical specifications:

1. 1RU 19" rack mounted
2. Input - 115VAC, 4 amp.
3. Qty (16) selectable 24VAC or 28VAC outputs with surge suppression.
4. 16 amp total output current.
5. (16) external blade fuse protected outputs rated at 3 amp.
6. Main fuse rated at 15 amp.
7. (16) power LED's on the front of the unit indicating the status of the outputs.
8. Illuminated master power disconnect circuit breaker with manual reset.

B. Acceptable Products:

1. Altronix VertiLine166.
2. Or Approved Equal.

**PART 3 - EXECUTION**

**3.1 ROUGH-IN**

- A. Before construction work commences, the Contractor shall visit the site and identify the exact location and mounting of all cameras.
- B. Camera mounting locations shall be coordinated with existing structure, lights, HVAC grilles, sprinklers, speakers, etc. Slight adjustments shall be made to the camera mounting locations to accommodate these items and to provide an unobstructed camera view.
- C. Notify the Owner's Representative of any obstructions that may block the camera views shown on the Drawings.
- D. The contractor shall minimize the amount of exposed conduit and boxes exposed to view. Paint all interior and exterior conduit exposed to view to match the existing surfaces.
- E. All exterior boxes, conduit, connections and penetrations shall be water-tight and painted to match existing surfaces.

**3.2 CUTTING AND PATCHING**

- A. The Contractor shall be responsible for all cutting, patching, coring and associated work to complete the camera installation. Patch adjacent work disturbed or damaged by installation of new work including insulation, walls and wall covering, ceiling and floor covering or other finished surfaces.
- B. The contractor shall be responsible for repairing any ceiling tile, ceiling grid, ceiling supports or adjacent surfaces damaged during the installation of the cameras.

**3.3 GENERAL INSTALLATION REQUIREMENTS**

- A. Coordinate ordering and installation of all equipment with long lead times or having a major impact on work by other trades so as not to delay the job or impact the schedule.
- B. Set all cameras and associated supports to accurate line and grade, level all equipment and align all equipment components.
- C. Provide all scaffolding, rigging, hoisting and services necessary for installation of equipment.
- D. Storage and security of material and equipment prior to installation shall be the responsibility of the Contractor.

- E. At the start of the project, provide a spreadsheet to the RENO VA IT Department indicating the camera number and hardware MAC address. RENO VA will provide IP addresses that can be programmed into each camera by the Contractor.

### **3.4 CEILING DOME CAMERA MOUNTING AND NETWORK CONNECTION**

- A. Install ceiling mounted dome cameras and support brackets in accordance with the Manufacturer's instructions.
- B. Verify ceiling mounted camera locations shown on the drawings. The contractor shall verify that adequate clearances exist above the camera to allow installation at the locations shown. The contractor shall make minor adjustments to the camera locations to avoid clearance conflicts. The contractor shall make minor adjustments to the camera mounting location to avoid conflicts with existing conditions including lights, sprinklers, fire alarm devices, speakers, exit signs, HVAC grilles, surface conduits, pullboxes, etc.
- C. Notify the Owner's representative where obstructions exist that may block the view from the camera prior to installing the camera.
- D. Where cameras are located in t-bar ceilings, cameras shall be centered in ceiling tiles at the proposed camera locations.
- E. Install a camera support cable from the camera to the structure above.
- F. Mount and secure the camera to the ceiling structure with the ceiling mount kit called out in the camera schedule.
- G. Furnish, install and terminate Category 6 cabling from the IP camera to the telecom room/telecom rack identified on the Drawings.
- H. Connect the camera to the network outlet with a CAT 6 patch cord of appropriate length.
- I. Cross-connect the cameras to the POE switches in the telecom rooms/telecom racks.
- J. The contractor shall assign static IP addresses to the camera with the IP address scheme specified by the RENO VA IT Department.
- K. Verify that the camera has the most current firmware version. If not, download and install the latest firmware version from the manufacturer's website.
- L. Logon to the camera and set the date and time. Set the time to Pacific Standard Time and configure the camera to automatically adjust for daylight savings time. Configure the camera to connect to a Network Time Protocol (NTP) server once every 24 hours and synchronize the time. Use NTP server IP Address as provided by the RENO VA.
- M. Change the default logon password on the IP camera web interface as directed by the RENO VAIT Dept.
- N. Add the camera to the database on the Video Recording Server.
- O. Configure camera ID, description and date/time stamping. The camera ID should follow the following naming convention: "Building Name - Camera # - Area - Location". For example "Bldg 1A-2<sup>nd</sup> Floor-Corridor".

### **3.5 PTZ CAMERA MOUNTING AND NETWORK CONNECTION**

- A. Notify the Owner's representative where obstructions exist that may block the view from the camera prior to installing the camera.
- B. Install PTZ cameras and mount brackets in accordance with the Manufacturer's instructions.
- C. Install mounting brackets and/or pendant mounts and securely anchor the mounting brackets to the existing structure.
- D. Route conduit to minimize the amount of conduit exposed to view.
- E. Install PTZ camera and secure to housing.
- F. Route power and data cables through camera support arm. Connect network cable via patch cord.

- G. Mount camera housing on support bracket and secure.
- H. Verify that camera and mounts are level and plumb.
- I. Verify that all components are secure to prevent vibrating or unstable images caused by wind or vibration.
- J. Furnish, install and terminate Category 6 cabling from the IP camera to the telecom room identified on the Drawings.
- K. Connect the camera to the network outlet with a CAT 6 patch cord of appropriate length.
- L. Cross connect the cameras to the POE switches in the telecom rooms.
- M. The contractor shall assign static IP addresses to the cameras with the IP address scheme specified by RENO VA.
- N. Verify power to the PTZ camera, housing heater and blower. Verify all PTZ functions on the camera.
- O. Verify that the camera has the most current firmware version. If not, download and install the latest firmware version from the manufacturer's website.
- P. Logon to the camera and set the date and time. Set the time to Pacific Standard Time and configure the camera to automatically adjust to daylight savings time. Configure the camera to connect to a Network Time Protocol (NTP) server once every 24 hours and synchronize the time. Use NTP server IP Address as provided by RENO VA.
- Q. Change the default logon password on the IP camera web interface as directed by RENO VA.
- R. Add the camera to the database on the Digital Video Recording Server and load the appropriate drivers for the camera.
- S. Configure camera ID, description and date/time stamping. The camera ID should follow the following naming convention: "Building Name - Camera # - Area - Location". For example "Bldg 1A - Exterior - Main Entry".
- T. Configure PTZ "home" position. Configure PTZ presets and scheduled tours.

### **3.6 FIXED CAMERA SETUP, FOCUSING AND ADJUSTMENT**

- A. Configure the best format (aspect ratio) and resolution for each camera view. The format for "narrow" or "tall" scenes should be set to 4:3 with a resolution of 1280 x 960. The format for "wide" scenes should be set to 16:9 with a resolution of 1280 x 720 (HD).
- B. Aim the camera with the horizontal field of view shown on the drawings. Cameras set to a wider field of view than shown on the drawings or in a "fish-eye" configuration will be required to be re-adjusted by the contractor.
- C. Adjust the vertical field of view so that the ceiling is not visible. For outdoor cameras, adjust the vertical field of view so that the sky is not visible. Secure the camera lens per the manufacturer's instructions.
- D. Use the camera's "easy focus" feature in the web interface to focus the camera based on the field of view set above. For cameras that have a web based zoom function, make fine adjustments to the field of view and re-focus the camera.
- E. The contractor shall re-aim and/or re-focus the camera as requested by the Owner's Representative during testing/commissioning of the surveillance camera system.
- F. Adjust the image quality settings on the camera to provide the clearest picture quality for all lighting conditions. The cameras may have several settings that affect the image quality including "Automatic Gain Control", "Auto Slow Shutter", "White Balance", etc. The contractor shall consult with the camera manufacturer and shall adjust

these settings to provide optimum image quality depending on the particular "scene" viewed by the camera.

- G. Configure the cameras to automatically switch to nighttime black & white mode. Review daytime and nighttime images from the camera to verify that it is properly focused and adjusted for normal lighting and low lighting conditions.
- H. For indoor cameras, configure the "motion" sensitivity settings within the video management software for each indoor camera so that images are only recorded when people or objects are moving within the field of view. Mask areas of the image that should not trigger motion based recording where applicable (i.e. ceilings, walls above 6'-0", trees, shrubs, etc). NOTE - THE PROPER CONFIGURATION OF THE MOTION SENSITIVITY SETTINGS IS CRITICAL TO THE PERFORMANCE OF THE SYSTEM. If the motion sensitivity is set too low, not all activity will be recorded by the system. If the motion sensitivity is set too high, images will be unnecessarily recorded resulting in server performance degradation and archiving issues. The contractor shall review and verify the motion sensitivity settings in a minimum of 3 different lighting conditions to verify that the cameras are not unnecessarily recording when no motion is present (Color normal lighting conditions, Color low lighting conditions and Black/White nighttime lighting conditions).
- I. Configure specific camera settings within the Video management software as follows:
  - 1. Settings Tab:
    - a. Day/Night Mode: Automatic.
    - b. H.264 - Streamed Frames per second: 10
    - c. H.264 - Streamed Bandwidth (bitrate): 2Mbps (indoor cameras), 3Mbps (Outdoor Cameras).
    - d. H.264 - Streamed Resolution: 1280x720 (HD) or 1280x960 (depending on view).
    - e. Recording Frame Rate: 10 fps.
    - f. Enable Video Stream Prebuffering and Postbuffering based on motion: 3 Seconds.

### **3.7 PTZ CAMERA SETUP AND ADJUSTMENT**

- A. Configure presets on the PTZ cameras as directed by the Owner. Presets should be named according to the view of the preset (i.e. "Bldg 1A Main Entry"). One preset should be identified and set as the "home" position of the camera. When the "home" position PTZ control button in the video client software is clicked, the camera should return to this preset.
- B. Configure scheduled "tours/patrols" on the camera so that the camera cycles between presets. The dwell time for each preset should be set to 10 seconds. Schedule tours/patrols on the cameras during hours as directed by RENO VA. Outside of these hours, the camera should return and remain at the preset "home" position. Assume qty (3) presets per camera and qty (2) scheduled tours per day.
- C. Configure the cameras to automatically switch to nighttime black & white mode based on lighting conditions. Review daytime and nighttime images from the camera to verify that it is properly focused and adjusted for normal lighting and low lighting conditions.
- D. Configure specific camera settings within the Video management software as follows:
  - 1. Settings Tab:
    - a. H.264 - Streamed Frames per second: 10
    - b. H.264 - Streamed Bandwidth (bitrate): 3mbps
    - c. H.264 - Streamed Resolution: 1024x720 (HD).

d. Recording Frame Rate: 10 fps.

**3.8 DIGITAL VIDEO MANAGEMENT SOFTWARE**

- A. Configure the recording servers to keep a minimum of 15 days of recorded images.
- B. Install client video viewing software on all workstations shown on the drawings. Configure the client software to interface with the recording server. Work with the RENO VA staff to create logical "camera groups" within the software to simplify viewing groups of cameras.

**3.9 TESTING AND COMMISSIONING**

- A. After completion of the project, the contractor shall test and commission the IP Video Surveillance System including all cameras, video recorders and software in the presence of the Owner's Representative. The contractor shall notify the Owner's Representative a minimum of (1) week prior to testing.
- B. At a minimum, the following tests shall be performed.
  - 1. Verify physical mounting of all cameras.
  - 2. Verify network connectivity to all cameras.
  - 3. Verify 24VAC power to all PTZ cameras and box camera housings.
  - 4. Verify aim and focus of all cameras.
  - 5. Verify that cameras have been properly focused for both daytime and nighttime use.
  - 6. Verify that cameras have been properly configured to switch to black & white mode automatically depending on lighting conditions.
  - 7. Verify frame rate and image recording settings on all cameras.
  - 8. Verify PTZ presets and tours/patrols. Verify that PTZ "home" position has been set.
  - 9. Verify proper motion sensitivity adjustment of cameras.
  - 10. Verify video recording and archiving settings.
  - 11. Verify proper installation and configuration of the client software.
- C. After completion of the commissioning, the Owner's Representative shall prepare a Punchlist of all items to be corrected. After the contractor has completed the Punchlist items to the satisfaction of the Owner's Representative, the Project will be considered "substantially complete" at which time the warranty period will begin.

**3.10 TRAINING**

- A. After completion of the camera installation, software installation, testing and commissioning, the contractor shall provide a minimum of 4 hours training to the Owner. Training shall cover usage and operation of the cameras, video recording servers and client software. The training shall consist of (1) 4 hour training sessions as scheduled by the Owner.

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