e) EN 61000-4-5

f) EN 61000-4-6

g) EN 61000-4-11

3) The camera shall carry the following Certifications:

a) UL 60950

b) CSA60950

4) The camera shall meet relevant parts of the following video standards:

a) SMPTE 296M (HDTV 720p)

5) The camera shall meet the following standards:

a) MPEG-4:

- ISO/IEC 14496-10 AVC (H.264)

b) Networking:

- IEEE 802.3af (Power over Ethernet)
- IEEE 802.1X (Authentication)
- IPv4 (RFC 791)

c) Mechanical environment:

- IK10 Impact Rating
- IEC 60529 IP66

E. ***BOX-TYPE NETWORK VIDEO CAMERAS***

1. The camera shall:

1) Be based upon standard components and proven technology using open and published protocols.

2) Be designed to provide video streams using H.264 or Motion JPEG image compression methods.

3) Be equipped with Day/Night functionality.

4) Include a built-in web server.

5) Utilize Power over Ethernet (PoE) allowing the camera and heater/fan functions to be powered over the network cable or external power source to allow operation at lower temperature ranges.

6) Contain a built-in web server making video and configuration available to in a standard browser environment using HTTP, without the need for additional software.

a) Web server shall support multiple users with different permission levels and unique usernames and password.

2. Performance

1. Video

1) The camera shall be capable of simultaneously delivering at least two individually configurable high-resolution video streams and one lower resolution video stream over IP networks.

2) The camera shall be one of three base models supporting the following video resolution and image rates (in frames per second-fps):

	1.0 Megapixel	2.0 Megapixel	3.0 Megapixel	5.0 Megapixel
768x432	30	30	30	30
1280x720 (HDTV 720p)	30	30	30	30
1920x1080 (HDTV 1080p)	-	30	30	30
2048x1536 (3MP)	-	-	20	20
2592x1944 (5MP)	-	-	-	13

2. Encoding

1) The camera shall:

a) Support Motion JPEG encoding in a selectable range from 1 up to 30 NTSC/25 PAL frames per second.

b) Support H.264 encoding in a selectable range from 1 up to 30 NTSC/25 PAL frames per second.

c) Be able to provide independently configured simultaneous H.264 and Motion JPEG streams (multi-stream).

d) Supports Variable Bit Rate (VBR) in H.264 with a configurable maximum bit rate threshold.

e) Provide user configuration of compression format, compression quality, maximum bit rate, key frame interval, and image rate per camera.

f) Support motion compensation and motion vector during motion estimation in H.264.

g) Support G.711 PCM 8kHz audio compression.

3. Transmission

1) The camera shall allow for video and audio to be transported over:

a) HTTP (Unicast)

b) HTTPS (Unicast)

c) RTP (Unicast & Multicast)

d) RTP over RTSP (Unicast)

e) RTP over RTSP over HTTP (Unicast)

f) RTP over RTSP over HTTPS (Unicast)

4. Image Control

1) The camera shall support user configuration of:

a) Automatic and Manual White Balance Control

b) Automatic and manually defined exposure zones operating in the range 1/6 and 1/8000 second.

c) Flicker Control (50 Hz , 60 Hz)

d) Automatic and Manual Iris Control

e) Automatic and Manual Day/Night Control

f) Color Saturation and Sharpening

g) Motion Detection sensitivity and threshold

h) Back Light Compensation

i) Manual rotation of the image

j) Wide Dynamic Range (WDR)

	1.0 Megapixel	2.0 Megapixel	WDR 3.0 Megapixel	5.0 Megapixel
Dynamic Range	69db	69db	100db	69db

5. Network

1) The camera shall support both fixed (static) IP addresses and dynamically assigned IP addresses provided by a Dynamic Host Control Protocol (DHCP) server.

2) The camera shall support user configuration of network parameters including:

a) Fixed (static) IP address

b) Subnet mask

c) Gateway

d) Control Port

3) The camera shall allow for automatic detection of the Camera when using a Video Management Application (VMA) or Network Video Recorder (NVR) supporting this feature.

4) The camera shall provide support for both IPv4.

6. Video Motion Detection Functionality

    1) The camera shall support video motion detection functionality.

    2) The camera motion detection shall be user configurable to detect motion based on:

        a) Motion detection mask; defines areas within the camera's field of view for the camera to detect for motion;

        b) Sensitivity; how much each pixel with the masked areas must change before it is considered in motion;

        c) Threshold; percentage of pixels that must detect change.

7. Event functionality

    1) The camera shall be equipped with an integrated event functionality, which can be trigged by:

        a) Alarm Input Terminal

        b) Video Motion Detection

        c) Fan malfunction

        d) Camera temperature outside operative range

        e) PTZ position

        f) Schedule

    2) Event functions shall be configurable via the web interface.

8. Protocol support

1) The camera shall incorporate support for at least IPv4, HTTP, HTTPS, SOAP, DNS, NTP, RTSP, RTCP, RTP, TCP, UDP, IGMP, ICMP, DHCP, Zeroconf, and ARP.

9. Video overlay

1) The Camera shall:

a) Provide four individually configurable privacy zones and 3D privacy masks to conceal defined areas in the image as non-viewable. These masks shall be dynamically adjusted based on current zoom-factor, and operator shall not be able to bypass.

b) Permanently obscure video masked by privacy zone prior to streaming video.

10. Security

1) The camera shall:

a) Support the use of password protection, and HTTPS encryption.

b) Restrict access to the built-in web server by usernames and passwords at three different user group levels.

11. API support

1) The camera shall be fully supported by an open and published API (Application Programmers Interface), which shall provide necessary information for integration of functionality into third party applications.

2) The camera shall conform to the network video standard version 1.02, version 2.00 and Profile S as defined by the ONVIF organization (www.onvif.org).

12. Installation and Maintenance

1) The camera shall:

a) Allow updates of the software (firmware) over the network.

b) All customer-specific settings shall be stored in a non-volatile memory and shall not be lost during power cuts or soft reset.

2) Manufacturer shall provide:

a) A Microsoft Windows®-based management software, which allows camera configuration, upgrade of firmware, and backup of individual camera configurations.

3. Materials

1. The camera shall be a factory assembly, designed for so-called continuous duty allowing for commercial/industrial 24/7/365 use.

2. The camera shall provide the following Optical requirements:

1) Use a progressive scan CMOS sensor.

	1.0 Megapixel	2.0 Megapixel	3.0 Megapixel	5.0 Megapixel
Sensor Size	1/2.7"	1/2.7"	1/3"	1/3.2"

2) Be equipped with a P-Iris lens supporting zoom and focus control by camera and user for up to 22mm.

3) Be equipped with lens options depending on camera model:
   a) 3-9mm varifocal lens
      - 1.0 and 2.0 MP models providing 35 to 98 degree angle of view
      - 5.0 and 3.0 MP models providing 28 to 84 degree angle of view
   b) 4.7-84.6mm varifocal lens
      - 1.0 and 2.0 MP models providing 3 to 52 degree angle of view
   c) 9-22mm providing;
      - 1.0 and 2.0 MP: 11 to 26 degree angle of view
      - 5.0 and 3.0 MP: 11 to 28 degree angle of view
4) Be equipped with an automatically and manually removable IR-cut filter, providing so-called day/night functionality where the camera enters a monochrome mode when the available light drops below a set threshold.
   a) While in day mode (color mode with IR-filter in use), provide pictures down:
      - 1.0, 2.0, and 3.0 MP: 0.2 lux at F1.2 and 0.4 lux at F1.6.
      - 5.0 MP: 0.3 lux at F1.2 and 0.6 lux at F1.6.
   b) While in night mode (monochrome mode with IR-filter removed), provide pictures down to:

- 1.0, 2.0, and 3.0 MP: 0.02 lux at F1.2 and 0.04 lux at F1.6.
- 5.0 MP: 0.03 lux at F1.2 and 0.06 lux at F1.6.

3. The camera shall provide the following Mechanical requirements:
   1) Be equipped with alarm input and output terminals.
   2) Be equipped with line audio input (for external microphone) and audio output (for external speaker) connections.
   3) Be equipped with an analog video output for external monitors.
   4) Be equipped with a firmware reset button to reset the camera to factory default settings.
4. The camera shall provide the following Camera Diagnostics:
   1) Be equipped with LEDs, indicating the camera's functional status.
   2) Allow user to disable Status LEDs.
   3) Be monitored by a Watchdog functionality, which shall automatically re-initiate processes or restart the unit if a malfunction is detected.
5. The camera shall provide physical interfaces to external devices & systems:
   1) Network interface
      a) The camera shall be equipped with one 100BASE-TX Fast Ethernet-port, using a standard RJ-45 socket and shall support auto negotiation of network

speed (100 MBit/s and 10 MBit/s) and transfer mode (full and half duplex).

2) Audio / Input Terminals

   a) The camera shall be equipped with one input terminal for receiving line level analog audio from an external microphone.

   b) The camera shall be equipped with one output terminal providing line level analog audio for connection to an external speaker.

3) Analog Video Output

   a) The camera shall be equipped with one NTSC/PAL, 3.5 mm A/V mini-jack for connection to external monitor.

4) External I/O Terminals

   a) The camera shall be equipped with two alarm input terminals and two alarm output terminals.

   b) Alarm inputs shall be individually configured for normally open/normally closed, duration of pre-recording and post-recording.

   c) Alarm outputs shall be individually configured for normally open/normally closed and duration of state change when triggered.

6. The camera shall be capable of being powered by the following power sources:

   1) PoE: IEEE 802.3af Class 4 PoE Plus Compliant

   2) 24 VAC

3) 24 VDC

7. The camera power consumption shall be:

1) 6 W

8. The camera shall be connected to power through:

1) Ethernet connection with IEEE 802.3af Class 3 PoE power

2) 2-pin connector with external power

9. The camera shall operate in the following environment:

a) Operate in a temperature range of -30 deg C to +50 deg C (-22 deg F to +122 deg F)

b) Operate in a humidity range of 20–80% RH (non-condensing)

c) Be stored in a temperature range of -10 deg C to +70 deg C (14 deg F to +158 deg F)

F. *BULLET-TYPE INFRARED NETWORK VIDEO CAMERAS*

1. The camera shall:

1) Be based upon standard components and proven technology using open and published protocols.

2) Be manufactured with an all aluminium body IP66 rated and suitable for outdoor installation.

3) Be designed to provide video streams using H.264 or Motion JPEG image compression methods.

4) Be equipped with Day/Night functionality.

5) Be equipped with Adaptive Video Analytic technology.

6) Be equipped with Adaptive IR Illumination technology.

a) The IR spread must dynamically adjust in conjunction with the field of view and zoom configured.

b) The IR intensity shall automatically adjust to compensate for excessive scene reflectivity and prevent image saturation.

7) Utilize Power over Ethernet (PoE) allowing the camera and heater/fan functions to be powered over the network cable or external power source to allow operation at lower temperature ranges.

8) Contain a built-in web server making video and configuration available to in a standard browser environment using HTTP, without the need for additional software.

a) Web server shall support multiple users with different permission levels and unique usernames and password.

2. Performance

1. Video

1) The camera shall be capable of simultaneously delivering at least two individually configurable high-resolution video streams and one lower resolution video stream over IP networks.

2) The camera shall be one of four base models supporting the following video resolution and image rates (in frames per second-fps):

	1.0 Megapixel	2.0 Megapixel	3.0 Megapixel	5.0 Megapixel
768x432	30	30	30	30
768x576	-	-	30	30
1280x720 (HDTV 720p)	30	30	30	30
1280x960	-	-	30	30
1920x1080 (HDTV 1080p)	-	30	30	30
2048x1536 (3MP)	-	-	20	20
2560x1440	-	-	-	13
2592x1944 (5MP)	-	-	-	13

2. Encoding

1) The camera shall:

a) Be able to provide independently configured simultaneous H.264 and Motion JPEG streams (multi-stream).

b) Support Motion JPEG encoding:

- Selectable range from 1 up to 30 NTSC/25 PAL frames per second.
- Supports compression and image quality settings from 1 to 64

- Provide user configuration of compression quality, bandwidth and image rate per camera.

c) Support H.264 encoding:

- Selectable range from 1 up to 30 NTSC/25 PAL frames per second.
- Supports variable bit rate (VBR) in H.264 with a configurable maximum bit rate threshold.
- Provide user configuration of compression format, compression quality, maximum bit rate, key frame interval and image rate per camera.

d) Support motion compensation and motion vector during motion estimation in H.264, able to maintain frame rate, regardless of scene complexity when bandwidth is capped at:

- 1024kbps, 1.0MP for 30 NTSC/25 PAL fps
- 2048kbps, 2.0MP for 30 NTSC/25 PAL fps
- 2560kbps, 3.0MP for 30 NTSC/25 PAL fps
- 2560kbps, 5.0MP for 13 NTSC/12 PAL fps

e) Support G.711 PCM 8kHz audio compression.

3. Transmission

1) The camera shall allow for video and audio to be transported over:

a) HTTP (Unicast)

b) HTTPS (Unicast)

c) RTP (Unicast & Multicast)

d) RTP over RTSP (Unicast)

e) RTP over RTSP over HTTP (Unicast)

f) RTP over RTSP over HTTPS (Unicast)

4. Image Control

1) The camera shall support user configuration of:

a) Automatic and Manual White Balance Control

b) Automatic and manually defined exposure zones operating in the range:

- 1.0MP camera – 1/6 and 1/8000 second
- 2.0MP camera – 1/6 and 1/8000 second
- 3.0MP camera – 1/6 and 1/8000 second
- 5.0MP camera – 1/6 and 1/8000 second

c) Flicker Control (50 Hz , 60 Hz)

d) Automatic and Manual Iris Control

e) Automatic and Manual Day/Night Control

f) Color Saturation and Sharpening

g) Motion Detection sensitivity and threshold

h) Back Light Compensation

i) Digital rotation of the image

j) Wide Dynamic Range (WDR) – the Dynamic Range shall be at a minimum:

	WDR 1.0 Megapixel	WDR 2.0 Megapixel	WDR 3.0 Megapixel	5.0 Megapixel
Dynamic Range	100db	100db	100db	69db

2) Scene Adaptive IR illumination technology

a) The IR spread must dynamically adjust to the camera field of view and zoom level through the use of focused and tuned LED's generating the specific spread and intensity of illumination.

b) The camera shall automatically adjust to compensate for excessive scene reflectivity and prevent image saturation by synchronizing the following camera settings to attain optimum video quality:

- Wide dynamic range
- Electronic Shutter Covering at minimum the range 1/6 to 1/8000
- P-Iris

c) The electronic shutter shall:

- When using a 3 to 9mm lens, the camera shall provide uniform illumination in the dark under 0 lux, up to a maximum distance of 30m (100ft)
- When using a 9 to 22mm lens, the camera shall provide uniform illumination in the dark under 0 lux, up to a maximum distance of 60m (200ft)

3) Adaptive Video Analytic Specifications

a) The device shall support an unlimited number of configured behaviors per video source:

b) Automatic analytic setup and tuning of behavior identification:

- Upon selection of analytic and Region of Interest (ROI), the device will automatically configure behavior identification
- The device will constantly monitor changes in the scene and perform a tuning of the behavior identification parameters as the scene environment changes.

c) Behaviors detected shall include, but not be limited to:

- Object present in ROI
- Object enters ROI
- Object leaves ROI
- Object appeared
- Object disappeared
- Object crosses (line of interest or beam)
- Object movement direction
- Object loitering
- Multiple objects in ROI in specified dwell time
- Dwell time
- Number of objects exceeds limit in ROI
- Number of objects below limit in ROI

- Camera tampering

5. Network

   1) The camera shall support both fixed (static) IP addresses and dynamically assigned IP addresses provided by a Dynamic Host Control Protocol (DHCP) server.

   2) The camera shall support user configuration of network parameters including (but not limited to):

      a) Fixed (static) IP address

      b) Subnet mask

      c) Gateway

      d) Control Port

   3) The camera shall allow for automatic detection of the Camera when using a Video Management Application (VMA) or Network Video Recorder (NVR) supporting this feature.

   4) The camera shall provide support for both IPv4 and IPv6 networks.

6. Video Motion Detection Functionality

   1) The camera shall support video motion detection functionality.

   2) The camera motion detection shall be user configurable to detect motion based on:

      a) Motion detection mask; defines areas within the camera's field of view for the camera to detect for motion;

b) Sensitivity; how much each pixel with the masked areas must change before it is considered in motion;

c) Threshold; percentage of pixels that must detect change.

7. Event functionality

1) The camera shall be equipped with an integrated event functionality, which can be trigged by:

a) Alarm Input Terminal

b) Video Motion Detection

c) Fan malfunction

d) Camera temperature outside operative range

e) PTZ position

f) Schedule

2) Event functions shall be configurable via the web interface.

8. Protocol support

1) The camera shall incorporate support for at least IPv4, HTTP, HTTPS, SOAP, DNS, NTP, RTSP, RTCP, RTP, TCP, UDP, IGMP, ICMP, DHCP, Zeroconf, and ARP.

9. Video overlay

1) The Camera shall:

a) Provide sixty four individually configurable privacy zones and 3D privacy masks to conceal defined areas in the image as non-viewable. These masks shall be dynamically adjusted based on current

zoom-factor, and operator shall not be able to bypass.

b) Permanently obscure video masked by privacy zone prior to streaming video.

10. Security

1) The camera shall:

a) Support the use of password protection, and HTTPS encryption.

b) Restrict access to the built-in web server by usernames and passwords at three different user group levels.

c) Provide configurable 802.1xport based authentication

11. API support

1) The camera shall be fully supported by an open and published API (Application Programmers Interface), which shall provide necessary information for integration of functionality into third party applications.

2) The camera shall conform to the network video standard version 1.02, version 2.00 and Profile S as defined by the ONVIF organization (www.onvif.org).

3) The analytics model shall confirm to the analytics service specification version 2.4.2 as defined by the ONVIF organization (www.onvif.org). Bounding boxes and scene descriptions are not available with third party VMS.

12. Installation and Maintenance

1) The camera shall:

   a) Allow updates of the software (firmware) over the network.

   b) All customer-specific settings shall be stored in a non-volatile memory and shall not be lost during power cuts or soft reset.

2) Manufacturer shall provide:

   a) A Microsoft Windows® -based management software, which allows camera configuration, upgrade of firmware, and backup of individual camera configurations.

3. Materials

1. The camera shall be a factory assembly, designed for so-called continuous duty allowing for commercial/industrial 24/7/365 use.

2. The camera shall provide the following Optical requirements:

   1) Use a progressive scan CMOS sensor.

	1.0 Megapixel	2.0 Megapixel	3.0 Megapixel	5.0 Megapixel
Sensor Size	1/3"	1/3"	1/3"	1/3.2"

   2) Be equipped with a P-Iris lens supporting zoom and focus control by camera and user.

   3) Be equipped with a factory integrated and tuned lens depending on camera model:

      a) 3-9mm varifocal F1.2 providing;

- 1.0 and 2.0 MP: 26 to 79 degree angle of view
- 5.0 and 3.0 MP: 28 to 84 degree angle of view

b) 9-22mm varifocal F1.6 providing;

- 1.0 and 2.0 MP: 11 to 26 degree angle of view
- 3.0 MP: 11 to 28 degree angle of view
- 5.0MP: 12 to 28 degree angle of view

4) Be equipped with an automatically and manually removable IR-cut filter, providing so-called day/night functionality where the camera enters a monochrome mode when the available light drops below a set threshold.

5) Be equipped with support for onboard storage

a) The camera shall accept SD cards (full size) to record video onboard the camera

b) Video recorded on the SD card shall be retrievable via the camera web interface or directly from the SD card

c) The camera's web interface shall allow for the configuration of onboard storage options. These parameters shall include, but not limited to:

- Recording on motion
- Recording continuously
- Recording when the server connection is interrupted

6) Be equipped with a real time clock.

7) Be equipped with Integrated IR-LED illuminators, providing adaptive IR illumination, tuned to the field of view and zoom level configured in the field and dynamically adjusting intensity as scene reflectivity changes.

a) While in day mode (color mode with IR-filter in use), provide pictures down to:

- 1.0, 2.0, and 3.0 MP: 0.2 lux at F1.2 and 0.4 lux at F1.6.
- 5.0 MP: 0.3 lux at F1.2 and 0.6 lux at F1.6.

b) While in night mode (monochrome mode with IR-filter removed), provide pictures down to:

- 1.0, 2.0, and 3.0 MP: 0.00 lux at F1.2 and 0.00 lux at F1.6.
- 5.0 MP: 0.00 lux at F1.2 and 0.00 lux at F1.6.

c) Maximum IR illumination Distance at 0 lux:

- 30 m (100 ft)
- 60 m (200 ft)

3. The camera shall provide the following Mechanical requirements:

1) Illuminator Technology

a) High-Power IR LED

b) Wavelength 850nm

2) Be equipped with alarm input and output terminals.

3) Be equipped with line audio input (for external microphone) and audio output (for external speaker) connections.

4) Be equipped with a configuration port for direct connection to the camera.

5) Be equipped with an analog video output for external monitors.

6) Be equipped with a firmware reset button to reset the camera to factory default settings.

4. The camera shall provide the following Camera Diagnostics:

1) Be equipped with LEDs, indicating the camera's functional status.

2) Allow user to disable Status LEDs.

3) Be monitored by a Watchdog functionality, which shall automatically re-initiate processes or restart the unit if a malfunction is detected.

4. The camera shall provide physical interfaces to external devices & systems:

1. Network interface

1) The camera shall be equipped with one 100BASE-TX Fast Ethernet-port, using a standard RJ-45 socket and shall support auto negotiation of network speed (100 MBit/s and 10 MBit/s) and transfer mode (full and half duplex).

2. Audio / Input Terminals

1) The camera shall be equipped with one input terminal for receiving line level analog audio from an external microphone.

2) The camera shall be equipped with one output terminal providing line level analog audio for connection to an external speaker.

3. Configuration port

1) The camera shall be equipped with a configuration port for direct connection to the camera without the need for network access.

2) The configuration port shall provide a live video stream and access to the camera's web interface for camera configuration.

4. Analog Video Output

1) The camera shall be equipped with one NTSC/PAL, 3.5 mm A/V mini-jack for connection to external monitor.

5. External I/O Terminals

1) The camera shall be equipped with one alarm input terminals and one alarm output terminals.

2) Alarm inputs shall be individually configured for normally open/normally closed, duration of pre-recording and post-recording.

3) Alarm outputs shall be individually configured: for and.

a) Normally open/normally closed

b) Duration of state change when triggered.

6. The camera enclosure shall include the following:

1) Manufactured with an all-aluminum body
    a) IP66-rating
    b) Temperature and humidity sensors
    c) Heater and fan inside the enclosure.
    d) Tamper resistant screws
2) Be equipped as a Surface Mount
3) The camera enclosure shall not exceed these dimensions:
    a) 241.7 mm x 94.9 mm x 70 mm (9.5" x 3.7" x 2.8")
4) The camera enclosure shall not exceed these weights:
    a) 1.15 kg (2.5 lbs)

7. The camera shall be capable of being powered by the following power sources:
    1) PoE: IEEE 802.3af Class 3 PoE Plus Compliant
    2) PoE: IEEE 802.3at Class 4 PoE Plus Compliant
    3) 24 VAC +/- 10%
    4) 12 VDC +/- 10%
8. The camera power consumption shall be:
    1) Not to exceed 13W with PoE 802.3af
    2) Not to exceed 22W with external power or PoE+ 802.3at
9. The camera shall be connected to power through:
    1) Ethernet connection with IEEE 802.3af Class 3 PoE power
    2) Auxiliary power cables with external power
10. The camera shall operate in the following environment:

a) Operate in a temperature range of -40 deg C to +50 deg C (-40 deg F to +122 deg F)

b) Operate in a humidity range of 20–80% RH (non-condensing)

c) Be stored in a temperature range of -10 deg C to +70 deg C (14 deg F to +158 deg F)

5. Certifications and Standards

1. The camera shall carry the following Electromagnetic Emissions Certifications:

1) EN 55022 Class B

2) FCC Part 15 Subpart B Class B

3) IC ICES-003 Class B

2. The camera shall carry the following Electromagnetic Immunity Certifications:

1) EN 55024 Class B

2) EN 61000-4-2

3) EN 61000-4-3

4) EN 61000-4-4

5) EN 61000-4-5

6) EN 61000-4-6

7) EN 61000-4-11

3. The camera shall carry the following Certifications:

1) UL 60950

2) CSA60950

4. The camera shall meet relevant parts of the following video standards:
    1) SMPTE 296M (HDTV 720p)
5. The camera shall meet the following standards:
    1) MPEG-4:
        a) ISO/IEC 14496-10 AVC (H.264)
    2) Networking:
        a) IEEE 802.3af (Power over Ethernet)
        b) IEEE 802.1X (Authentication)
        c) IPv4 (RFC 791)
    3) Mechanical environment:
        a) IK10 Impact Rating
        b) IEC 60529 IP66

G. *PAN, TILT AND ZOOM DOME-TYPE NETWORK VIDEO CAMERAS*

1. The camera shall:
    1) Be based upon standard components and proven technology using open and published protocols.
    2) Be designed to provide video streams using H.264 or Motion JPEG image compression methods.
    3) Be equipped with Day/Night functionality, provide high speed pan and tilt functions and be equipped with 20x optical and 4x digital zoom.
    4) Include a built-in web server.

5) Be manufactured with an all-aluminum body suitable for outdoor installation, support operation down to -40 deg_C (-40 deg_F) and be IP66 rated.

6) Utilize Power over Ethernet (PoE) allowing the camera and heater/fan functions to be powered over the network cable or external power source to allow operation at lower temperature ranges.

7) Contain a built-in web server making video and configuration available to in a standard browser environment using HTTP, without the need for additional software.

a) Web server shall support multiple users with different permission levels and unique usernames and password.

2. Performance

1. Video

1) The camera shall be capable of simultaneously delivering at least two individually configurable full resolution full frame rate video streams and one lower resolution full frame rate video stream over IP networks.

2) Supported video resolutions shall include:

a) 768x432

b) 1280x720 (HDTV 720p)

c) 1920x1080 (HDTV 1080p)

2. Encoding

1) The camera shall:

a) Support Motion JPEG encoding in a selectable range from 1 up to 30 NTSC/25 PAL frames per second in all resolutions.

b) Support H.264 encoding in a selectable range from 1 up to 30 NTSC/25 PAL frames per second in all resolutions.

c) Be able to provide independently configured simultaneous H.264 and Motion JPEG streams (multi-stream).

d) Supports Variable Bit Rate (VBR) in H.264 with a configurable maximum bit rate threshold.

e) Provide user configuration of compression format, compression quality, maximum bit rate, key frame interval, and image rate per camera.

f) Support motion compensation and motion vector during motion estimation in H.264.

g) Support G.711 PCM 8kHz audio compression.

3. Transmission

1) The camera shall allow for video and audio to be transported over:

a) HTTP (Unicast)

b) HTTPS (Unicast)

c) RTP (Unicast & Multicast)

d) RTP over RTSP (Unicast)

e) RTP over RTSP over HTTP (Unicast)

f) RTP over RTSP over HTTPS (Unicast)

4. Image Control

    1) The camera shall support user configuration of:

        a) Automatic and Manual White Balance Control

        b) Automatic and manually defined exposure zones operating in the range 1/6 and 1/8000 second.

        c) Flicker Control (50 Hz , 60 Hz)

        d) Automatic and Manual Iris Control

        e) Automatic and Manual Day/Night Control

        f) Color Saturation and Sharpening

        g) Motion Detection sensitivity and threshold

        h) Back Light Compensation and Wide Dynamic Range (WDR)

5. Network

    1) The camera shall support both fixed (static) IP addresses and dynamically assigned IP addresses provided by a Dynamic Host Control Protocol (DHCP) server.

    2) The camera shall support user configuration of network parameters including:

        a) Fixed (static) IP address

        b) Subnet mask

        c) Gateway

        d) Control Port

    3) The camera shall allow for automatic detection of the Camera when using a Video Management Application

(VMA) or Network Video Recorder (NVR) supporting this feature.

4) The camera shall provide support for both IPv4.

6. PTZ functionality

1) The camera shall provide the following remote pan/tilt/zoom (PTZ) functionality:

a) Provide at least 100 named preset positions.

b) Provide so-called Home Position, which allows the dome to move to a present position after all operators have ceased manual operation of the dome for a defined idle time.

c) Provide so-called E-Flip functionality, which will automatically rotate the image 180 deg electronically when the camera tilts through the zenith.

d) Provide at least 10 named guard tours, which allows the dome to automatically move between selected presets using an individual speed and viewing time for each preset.

7. Video Motion Detection Functionality

1) The camera shall support video motion detection functionality.

2) The camera motion detection shall be user configurable to detect motion based on:

a) Motion detection mask; defines areas within the camera's field of view for the camera to detect for motion;

b) Sensitivity; how much each pixel with the masked areas must change before it is considered in motion;

c) Threshold; percentage of pixels, which must detect change.

3) Motion detection shall automatically suspend when the dome is in motion.

8. Event functionality

1) The camera shall be equipped with an integrated event functionality, which can be trigged by:

a) Alarm Input Terminal

b) Video Motion Detection

c) Fan malfunction

d) Camera temperature outside operative range

e) PTZ position

f) Schedule

2) Event functions shall be configurable via the web interface.

9. Protocol support

1) The camera shall incorporate support for at least IPv4, HTTP, HTTPS, SOAP, DNS, NTP, RTSP, RTCP, RTP, TCP, UDP, IGMP, ICMP, DHCP, Zeroconf, and ARP.

10. Video overlay

1) The Camera shall:

a) Provide four individually configurable privacy zones and 3D privacy masks to conceal defined areas in

the image as non-viewable. These masks shall be dynamically adjusted based on current zoom-factor, and operator shall not be able to bypass.

b) Permanently obscure video masked by privacy zone prior to streaming video.

11. Security

1) The camera shall:

a) Support the use of password protection, and HTTPS encryption.

b) Restrict access to the built-in web server by usernames and passwords at three different user group levels.

12. API support

1) The camera shall be fully supported by an open and published API (Application Programmers Interface), which shall provide necessary information for integration of functionality into third party applications.

2) The camera shall conform to the network video standard version 1.02, version 2.00 and Profile S as defined by the ONVIF organization (www.onvif.org).

13. Installation and Maintenance

1) The camera shall:

a) Allow updates of the software (firmware) over the network.

b) All customer-specific settings shall be stored in a non-volatile memory and shall not be lost during power cuts or soft reset.

2) Manufacturer shall provide:

a) A Microsoft Windows®-based management software, which allows camera configuration, upgrade of firmware, and backup of individual camera configurations.

3. Materials

1. The camera shall be a factory assembly, designed for so-called continuous duty allowing for commercial/industrial 24/7/365 use.

2. The camera shall provide the following Optical requirements:

1) Use a high quality WDR 1/2.8" progressive scan CMOS sensor.

2) Be equipped with an automatically and manually removable IR-cut filter, providing so-called day/night functionality where the camera enters a monochrome mode when the available light drops below a set threshold.

3) Be equipped with a high quality F1.6 DC-iris lens with motorized 20x (4.7mm - 94mm) optical zoom providing a horizontal angle of view between 55.2 deg and 2.9 deg and supporting remote controlled zoom with manual or automatic focus control.

4) Provide pictures down to 0.4 lux at F1.6 while in day mode (color mode with IR-filter in use) and down to 0.04

lux at F1.6 while in night mode (monochrome mode with IR-filter removed).

3. The camera shall provide the following Mechanical requirements:
    1) Be equipped with accurate high-speed pan-tilt functionality with 360 deg endless pan range and a 186 deg tilt range.
    2) Provide pan and tilt speed between 0.05 deg - 450 deg/sec.
    3) Be equipped with alarm input and output terminals.
    4) Be equipped with line audio input (for external microphone) and audio output (for external speaker) connections.
    5) Be equipped with an analog video output for external monitors.
4. The camera shall provide the following Camera Diagnostics:
    1) Be equipped with LEDs, indicating the camera's functional status.
    2) Allow user to disable Status LEDs.
    3) Be monitored by a Watchdog functionality, which shall automatically re-initiate processes or restart the unit if a malfunction is detected.
5. The camera shall provide physical interfaces to external devices & systems:
    1) Network interface

a) The camera shall be equipped with one 100BASE-TX Fast Ethernet-port, using a standard RJ-45 socket and shall support auto negotiation of network speed (100 MBit/s and 10 MBit/s) and transfer mode (full and half duplex).

2) Audio / Input Terminals

a) The camera shall be equipped with one input terminal for receiving line level analog audio from an external microphone.

b) The camera shall be equipped with one output terminal providing line level analog audio for connection to an external speaker.

3) Analog Video Output

a) The camera shall be equipped with one NTSC/PAL, 3.5 mm A/V mini-jack for connection to external monitor.

4) External I/O Terminals

a) The camera shall be equipped with two alarm input terminals and two alarm output terminals.

b) Alarm inputs shall be individually configured for normally open/normally closed, duration of pre-recording and post-recording.

c) Alarm outputs shall be individually configured for normally open/normally closed and duration of state change when triggered.

6. The camera enclosure shall include the following:

1) Manufactured with an all-aluminum body

2) Clear and smoked transparent acrylic dome bubble
3) IP66-rating
4) Temperature and humidity sensors, fans and two heaters inside the enclosure.
5) Dedicated fan directing heated air towards the area of the lower dome where the camera is physically pointed.
6) Tamper resistant screws
7) Pendant mount
8) The camera enclosure shall not exceed the dimensions 226 mm x 299.77 mm (8.9" x 11.8").
9) The camera enclosure shall not exceed 3.9 kg (8.6 lbs).

7. The camera shall be capable of being powered by the following power sources:
   1) PoE: IEEE 802.3at Class 4 PoE Plus Compliant
   2) 24 VAC
   3) 24 VDC
8. The camera power consumption shall be:
   1) 25 W with IEEE 802.3at Class 4 PoE Plus
   2) 44 W with external power
9. The camera shall be connected to power through:
   1) Ethernet connection with IEEE 802.3at Class 4 PoE Plus power
   2) Waterproof 2-pin connector with external power
10. The camera shall operate in the following environment:

a) Operate in a temperature range of -30 deg C to +50 deg C (-22 deg F to +122 deg F) with IEEE 802.3at Class 4 PoE Plus power.

b) Operate in a temperature range of -45 deg C to +50 deg C (-50 deg F to +122 deg F) with external power.

c) Operate in a humidity range of 20–80% RH (non-condensing).

d) Be stored in a temperature range of -10 deg C to +70 deg C (14 deg F to +158 deg F)

PIJ 02 02 06 HIGH-DEFINITION VIDEO SURVEILLANCE MONITORS

H. *VIDEO WALL AND OBSERVATION MONITORS – 42"*

1. 42" Monitors are required to be supplied and installed in the Central and Secondary Control Rooms to form a Video Wall with a 10 x 2 configuration. A single 42" Monitor is also required to supplied and installed in each Satellite Control Room as an observation monitor.
2. These monitors shall meet or exceed the following minimum technical specifications:

a.	Diagonal Screen Size	42"
b.	Type	120Hz LED BLU
c.	Resolution	1920 x 1080p
d.	Aspect Ratio	16:9
e.	Pixel Pitch	0.461(H) x 0.153(V)
f.	Brightness	450 cd/m²
g.	Contrast Ratio	6000:1

h.	Response Time	5.5ms
i.	Anti-Image Retention	Yes
j.	Input	Display Port / DVI / HDMI to suite VWWS
k.	Mounting	Wall-Mount VESA 400 x 400mm
l.	Narrow Bezel	5mm maximum
m.	Warranty	2-Year

I. *INVESTIGATION STATION MONITORS – 23"*

1. 23" Monitors are to be supplied and installed onto 2-off 2-Monitor Investigation Stations in each of the Central and Secondary Control Rooms. A single 23" Monitor is also required to be supplied and installed in each Satellite Control Room as an investigation monitor alongside the 42" observation monitor.
2. These monitors shall meet or exceed the following minimum technical specifications:

a.	Diagonal Screen Size	23"
b.	Type	60Hz LED BLU
c.	Resolution	1920 x 1080p
d.	Aspect Ratio	16:9
e.	Viewing Angle	170°/160°
f.	Brightness	250 cd/m²
g.	Contrast Ratio	1000:1
h.	Response Time	2ms
i.	Input	Display Port / DVI / HDMI to suite RMWS
j.	Mounting	Desktop Tilt

PIJ 02 02 07 POWER-OVER-ETHERNET NETWORK SWITCHES: ACCESS LAYER

A mix of rack-mountable 8-Port and 24-Port Gigabit Ethernet Network Switches are to be supplied and installed in 19' Wall-Mount cabinets in the respective Satellite Control Rooms throughout the facility. These network switches will form the access layer of the network and will provide the base for a fibre uplink to Core Switches situated in both the Central and Secondary Control Rooms. Industrial Network Switches are also to be supplied and installed in weatherproof cabinets located around the perimeter of the facility to form a redundant ring. These network switches shall meet or exceed the following minimum technical specifications:

J. ***POE NETWORK SWITCH: 24-PORT***

1. The switch shall meet or exceed the following minimum technical specifications:

- Twenty-four 10/100/1000 Ethernet ports
- Two Small Form-Factor Pluggable (SFP) slots for fiber Gigabit Ethernet uplink
- IEEE 802.3af PoE delivered over twenty-four 10/100/1000 RJ-45 copper ports
- Up to 15.4W available on the copper ports for powering PoE-enabled IP-cameras, with a maximum per-device PoE delivery of 185W available for all ports
- Dual images for resilient firmware upgrades
- 48-Gbps, non-blocking, store-and-forward switching capacity
- Simplified QoS management using 802.1p, Differentiated Services (DiffServ), or type of service (ToS) traffic prioritization specifications

- Fully resilient stacking for optimized growth with simplified management
- ACLs for granular security and QoS implementation
- Can be configured and monitored from a standard web browser
- Secure remote management of the switch via Secure Shell (SSH) and SSL encryption
- 802.1Q-based VLANs enable segmentation of networks for improved performance and security
- Private VLAN Edge (PVE) for simplified network isolation of guest connections or autonomous networks
- Automatic configuration of VLANs across multiple switches through Generic VLAN Registration Protocol
- (GVRP) and Generic Attribute Registration Protocol (GARP)
- User/network port-level security via 802.1X authentication and MAC-based filtering
- Increased bandwidth and added link redundancy with Link Aggregation Control Protocol (LACP)
- Enhanced rate-limiting capabilities, including back pressure and multicast and broadcast flood control
- Port mirroring for noninvasive monitoring of switch traffic
- Jumbo frame support up to 10KB
- Simple Network Management Protocol (SNMP) versions 1, 2c, and 3 and Remote Monitoring (RMON) support
- Fully rack mountable including rack-mounting hardware

K. ***POE NETWORK SWITCH: 8-PORT***

1. The switch shall meet or exceed the following minimum technical specifications:

a. Ten 10/100/1000 Ethernet ports
b. Two Small Form-Factor Pluggable (SFP) slots (shared with two copper ports) for fiber Gigabit Ethernet uplink
c. IEEE 802.3af PoE delivered over eight of the 10/100/1000 RJ-45 copper ports
d. Up to 15.5W available on the copper ports for powering POE-enabled IP-cameras, with a maximum per-device POE delivery of 124W available for all ports
e. 20-Gbps, non-blocking, store-and-forward switching capacity
f. Smartports for simplified configuration of QoS and security capabilities
g. Can be configured and monitored from a standard web browser
h. Secure remote management of the switch via Secure Shell (SSH) encryption
i. 802.1Q-based VLANs enable segmentation of networks for improved performance and security
j. Private VLAN Edge (PVE) for simplified network isolation of guest connections or autonomous networks
k. Automatic configuration of VLANs across multiple switches through Generic VLAN Registration Protocol
l. (GVRP) and Generic Attribute Registration Protocol (GARP)
m. User/network port-level security via 802.1X authentication
n. Port mirroring for noninvasive monitoring of switch traffic
o. Jumbo frame support up to 10KB
p. Simple Network Management Protocol (SNMP) versions 1, 2c, and 3 and Remote Monitoring (RMON) support
q. Fully rack mountable including rack-mounting hardware

L. ***POE NETWORK SWITCH: 4-PORT INDUSTRIAL***

1. The switch shall meet or exceed the following minimum technical specifications:

a. Four 10/100/1000 Ethernet ports
b. Two Small Form-Factor Pluggable (SFP) slots for fiber Gigabit Ethernet uplink
c. IEEE 802.3af / IEEE 802.3at PoE delivered over four 10/100/1000 RJ-45 copper ports
d. Up to 30W available on the copper ports for powering PoE-enabled IP-cameras, with a maximum per-device PoE delivery of 120W available for all ports
e. 12-Gbps, non-blocking, store-and-forward switching capacity
f. Can be configured and monitored from a standard web browser
g. Auto-detect EEE 802.3af/at equipment and protect device from being damaged
h. Remote power feeding up to 100m
i. Supports auto-negotiation and 10/100Mbps half/full duplex and 1000Mbps full duplex mode
j. Prevents packet loss with back pressure (half-duplex) and IEEE 802.3x PAUSE frame flow control (full duplex)
k. Automatic address learning and address aging
l. IP30 aluminium metal case
m. DIN rail kit and wall mount ear

PIJ 02 02 08 POWER-OVER-ETHERNET NETWORK SWITCHES: CORE

One each of the following Enterprise class 10-Gigabit Ethernet Network Switches are required to be supplied and installed in a network stack in each of the Central and Secondary Control Rooms to form the core, and

to cater for redundancy will connect across Control Rooms via a cross-over 10GbE fibre link. These network switches shall meet or exceed the following minimum technical specifications:

M. ***POE NETWORK SWITCH: 48-PORT (WS-C3750X-48T-E or equivalent)***

1. The switch shall meet or exceed the following minimum technical specifications:

a. Forty-eight 10/100/1000 Ethernet ports
b. Small Form-Factor Pluggable (combination SFPx2 and SFP+ x2) module for 10-Gigabit / Gigabit Ethernet uplink
c. IEEE 802.3at PoE delivered over forty-eight 10/100/1000 RJ-45 copper ports
d. Up to 30W available on the copper ports for powering PoE-enabled IP-cameras, with a maximum per-device PoE delivery of 800W available for all ports
e. Dual redundant, modular power supplies and fans
f. 160-Gbps, non-blocking, store-and-forward switching capacity
g. Media Access Control Security hardware based encryption
h. Flexible NetFlow and switch-to-switch hardware encryption with service module uplink
i. IPv4 and IPv6 routing, multicast routing, advanced QoS and security features in hardware
j. Fully resilient stacking for optimized growth with simplified management and 64Gbps of throughput
k. Increased bandwidth and added link redundancy with Link Aggregation Control Protocol (LACP)

l. Enhanced rate-limiting capabilities, including back pressure and multicast and broadcast flood control
m. Port mirroring for noninvasive monitoring of switch traffic
n. Jumbo frame support up to 10KB
o. Secure Shell (SSH) Protocol, Kerberos, and Simple Network Management Protocol Version 3 (SNMPv3) provide network security by encrypting administrator traffic during Telnet and SNMP sessions.
p. Fully rack mountable including rack-mounting hardware

N. ***POE NETWORK SWITCH: 24-PORT (WS-C3750X-24S-E or equivalent)***

1. The switch shall meet or exceed the following minimum technical specifications:

a. Twenty-four Gigabit Ethernet SFP ports
b. Small Form-Factor Pluggable (combination SFPx2 and SFP+ x2) module for 10-Gigabit / Gigabit Ethernet uplink
c. Dual redundant, modular power supplies and fans
d. 160-Gbps, non-blocking, store-and-forward switching capacity
e. Media Access Control Security hardware based encryption
f. Flexible NetFlow and switch-to-switch hardware encryption with service module uplink
g. IPv4 and IPv6 routing, multicast routing, advanced QoS and security features in hardware
h. Fully resilient stacking for optimized growth with simplified management and 64Gbps of throughput

i. Increased bandwidth and added link redundancy with Link Aggregation Control Protocol (LACP)
j. Enhanced rate-limiting capabilities, including back pressure and multicast and broadcast flood control
k. Port mirroring for noninvasive monitoring of switch traffic
l. Jumbo frame support up to 10KB
m. Secure Shell (SSH) Protocol, Kerberos, and Simple Network Management Protocol Version 3 (SNMPv3) provide network security by encrypting administrator traffic during Telnet and SNMP sessions.
n. Fully rack mountable including rack-mounting hardware

PIJ 03.02 **SPECIFICATION FOR UPS SYSTEMS**

PIJ 03.02.01 The unit shall be transformer based, offering galvanic isolation between the input and output.

PIJ 03.02.02 The unit shall be of an 'on-line', double conversion' design, **not** line interactive or offline.

PIJ 03.02.03 The unit shall offer microprocessor controlled high frequency Pulse Width Modulation technology.

PIJ 03.02.04 The unit shall be able to function properly with non-grid, stand-alone generators.

PIJ 03.02.05 Input Voltage –20% 220VAC – 240VAC +20%

PIJ 03.02.06 Input Frequency 50Hz ± 5%

PIJ 03.02.07 Output Voltage regulation shall be better than ±3% of nominal voltage at 100% load

PIJ 03.02.08 Output Voltage regulation shall be better than ±1% (Steady State) of nominal voltage from no load to full load.

PIJ 03.02.09 The unit shall have the ability to operate constantly at full load from 0-40 Degrees Celsius up to 95% relative humidity (non-condensing)

PIJ 03.02.10 The unit shall withstand impulses of 6kV and 3kA (Lightning withstand)

PIJ 03.02.11 The unit shall be able to operate normally under overload conditions as follows:-

1000% up to 100msec.
200% up to 30sec.
125% up to 1hour.

PIJ 03.02.12 The unit shall have a THD at full linear load of less than 3%.

PIJ 03.02.13 The unit shall have the ability to function properly with a load power factor of better than 0.7 lag to 0.9 lead.

PIJ 03.02.14 The unit shall have an efficiency of better than 84% (input to output)

PIJ 03.02.15 The unit shall have an integral electronic discrete static bypass switch such that when this is operated there is no interruption or break of the output of the UPS whilst input power is available.

PIJ 03.02.16 The unit shall have an integral mechanically switched maintenance/bypass facility such that when this is operated there is no interruption of the output of the UPS whilst input power is available.

PIJ 03.02.17 The unit shall be of a South African design, for South African Conditions

PIJ 03.02.18 The unit shall be manufactured in SA. (Local content of not less than 80% by mass.)

PIJ 03.02.17 The unit's OEM shall be SA based and will have locally produced these machines for not less than 10 years.

PIJ 03.02.20 The OEM shall have permanently employed, technically competent service technicians in all major centres in SA.

PIJ 03.02.21 The OEM shall stock a full range of spare parts for no less than 10 years after the date of manufacture of the last unit.

PIJ 03.02.22 The unit shall not have an acoustic noise level of greater than 51dBA at 1m distance.

PIJ 03.02.23 The 3kVA unit shall have internal VRLA batteries, connected to allow a 15minute period of autonomous operation at full load.

PIJ 03.02.24 The 3kVA unit shall have the ability for extra batteries (housed in separate cabinets) to be connected to allow up to a 140 minute period of autonomous operation at full load without any modification to the unit.

PIJ 03.02.25 The 5kVA unit shall have internal VRLA batteries, connected to allow a 12 minute period of autonomous operation at full load.

PIJ 03.02.26 The 5kVA unit shall have the ability for extra batteries (housed in separate cabinets) to be connected to allow up to a 50 minute period of autonomous operation at full load without any modification to the unit.

PIJ 03.02.27 The unit shall have the ability to operate in 'free-run' mode, where the unit output frequency is not synchronised with the input frequency and shall be at a constant 50Hz $\pm$0.2%.

PIJ 03.02.28 The unit's output frequency shall have the ability to be synchronised with the input frequency ± 2%.

PIJ 03.02.29 It shall be possible to isolate the batteries via an integral switch, such that when this is operated there is no interruption of the output of the UPS whilst mains power is available.

PIJ 03.02.30 The unit shall comply with Telkom RFI regulations.

PIJ 03.02.31 The unit shall have a RS232c computer interface as standard.

PIJ 03.02.32 The unit shall have the capability as standard, to be upgraded to have status and alarm relay contacts, a remote alarm panel and SNMP capability, with the addition of extra components and not by having to change out or modify any existing standard components.

PIJ 03.03 SPECIFICATION FOR UPS SYSTEMS FOR 8kVA - 15kVA RATINGS

PIJ 03.03.01 The unit shall be of an 'on-line', double conversion' design, **not** line interactive or offline.

PIJ 03.03.02 The unit shall offer microprocessor controlled high frequency Pulse Width Modulation technology.

PIJ 03.03.03 The unit shall have internal VRLA batteries, connected to allow a minimum of 15 minutes of autonomous operation at full load.

PIJ 03.03.04 The unit shall have the ability for extra batteries (housed in separate cabinets) to be connected to allow a minimum of 45 minutes of autonomous operation at full load without any modification to the unit.

PIJ 03.03.05 The unit shall be able to function properly with non-grid, stand-alone generators.

PIJ 03.03.06 The unit shall be able to function properly Input Voltage –20% 220VAC – 240VAC +20%

PIJ 03.03.07 The unit shall be able to function properly within an Input Frequency of 45 - 65Hz.

PIJ 03.03.08 The unit shall have constant, active, input PF correction of 0.99 across the whole load range of the unit.

PIJ 03.03.09 The unit shall have the ability to operate constantly at full load from 0-40 Degrees Celsius, up to 45 Degrees Celsius with 7.5% derating and up to 95% relative humidity. (non-condensing)

PIJ 03.03.10 The unit shall have the ability to operate in 'free-run' mode, where the unit output frequency is not synchronized with the input frequency and shall be at a constant 50Hz $\pm$0.2%.

PIJ 03.03.11 Output Voltage regulation shall be better than ± 2% (static) and better than ± 5% at 100% load change, with less that 100ms response time.

PIJ 03.03.12 The unit shall be able to operate normally under overload conditions as follows:-

150% up to 5sec on battery.
150% up to 60sec on mains.
125% up to 10 minutes on mains.
110% up to 60 minutes on mains.

PIJ 03.03.13 The unit shall be able to operate at continuous full load up to an altitude of 1000m without derating.

PIJ 03.03.14 The unit shall be able to operate correctly with an input current distortion (THD) of 2-5%.

PIJ 03.03.15 The unit shall have the ability to function properly with a load power factor of better than 0.7 lag to 0.8 lead.

PIJ 03.03.16 The unit shall have an efficiency of better than 92% (computer load) and 93% (linear load).

PIJ 03.03.17 The unit shall have an integral electronic discrete static bypass switch such that when this is operated there is no interruption or break of the output of the UPS whilst input power is available.

PIJ 03.03.18 The unit shall have an integral mechanically switched maintenance/bypass facility such that when this is operated there is

no interruption of the output of the UPS whilst input power is available.

PIJ 03.03.19 The unit shall have the ability to be installed in a parallel redundant configuration with up to three other identical units without there being any potential single point of failure. (ie 4 units in parallel)

PIJ 03.0320 The unit shall have the ability to charge the batteries using ABM technology. The charging cycle begins by charging the batteries for 2 days, then resting the batteries for up to 18 days with the proviso that should the battery voltage drop by more that 2% of the nominal fully charged voltage, the cycle will be reset and will begin again. During the resting period there shall be no 'trickle' charge. If the batteries are used for a power outage during this time, the cycle will reset and will begin again from the time of mains power to the unit being restored.

PIJ 03.03.21 The unit shall have the ability to self test batteries by means of commands entered via the user interface.

PIJ 03.03.22 The unit's OEM shall have established representation in all major centres in SA.

PIJ 03.03.23 There shall be permanently employed, technically competent service technicians in all major centres in SA that have had correct training on the specific make and type offered.

PIJ 03.03.24 There shall be sufficient stock of a full range of spare parts in South Africe for no less than 10 years after the date of manufacture of the last unit.

PIJ 03.03.25 The unit shall **not** have an acoustic noise level of greater than 50dBA at 1m distance.

PIJ 03.03.26 The unit shall have dimensions not exceeding 305mm wide x 702mm long x 397mm high, without batteries.

PIJ 03.03.27 The unit's output frequency shall have the ability to be synchronized with the input frequency ± 2%.

PIJ 03.03.28 It shall be possible to isolate the batteries via an integral switch, such that when this is operated there is no interruption of the output of the UPS whilst mains power is available.

PIJ 03.03.29 The unit's OEM shall comply with ISO 9001: 2000; ISO14001:1996.

PIJ 03.03.30 The unit shall comply with IEC 62040-1-1; IEC 60950; EN 62040-1-1 and EN 50091-2 Class A standards.

PIJ 03.03.31 The unit shall have the CE and GOST markings

PIJ 03.03.32 The unit shall the ability to operate with any 2 of the following optional extra features that are installed by means of 'X-Slots, without any internal modification to the unit :- Web/SNMP, Modbus/Jbus; Relay, Hot Sync and RS232.

PIJ 04 INTERCOMMUNICATIONS AND PUBLIC ADDRESS SYSTEMS

STANDARD SYSTEM FEATURES

- The intercom and/or PA system shall operate on a IEEE 802 TCP/IP network
- All field devices shall use T568A/B wiring standard (no device trunk cabling shall be non-standard)
- All intercom and/or PA system devices shall be TCP/IP devices that connect directly to an RJ45 port on an Ethernet switch of standard 10BaseT, 10/100 Ethernet or Gigabit Ethernet
- Intercom devices shall support IEEE 802.3af Power-Over-Ethernet (PoE) allowing for power, data and voice communications to be transmitted using ONLY a single CAT5/5e/6 cable connected to a IEE 802.3af PoE switch (JEM-2+ series intercoms)
- Intercom and PA devices shall support direct connection of DC voltage for powering of intercom & PA devices with an allowable range of (12-32) V d.c.
- Communication between field devices and switches shall be over UTP, STP, CAT5/6 with a length limitation of 100 meters; or over multimode/single mode fibre optic cable with appropriate media converters
- The system call activity shall operate;
    - in standalone mode, under the control of the IP system controller and/or,

  - under the control (via high level interface) of third party building/security management systems

- The system shall support full duplex audio communication
- The system shall be scalable to an unlimited number of endpoints, only limited by the network configuration and bandwidth
- The system shall support a redundant controller high availability scheme with automatic controller switch-over ensuring high system reliability
- The system shall support a distributed controller framework whereby secondary controllers may take control of their sub networks should connectivity to the primary controller be lost
- The system shall act as a digital message store with playback and recording announcement, audio input live or pre-recorded audio sources to system endpoints
- The system shall control the distribution of TCP/IP broadcast streams of background music to all or any of the intercoms on the system
- The system shall be optionally configurable for Quality of Service to ensure call audio is robust in the midst of high network traffic
- The system shall support synchronisation of system clocks using Network Time Protocol (NTP)
- The system shall support dynamic or static IP address assignment for all intercom/PA devices
- The system shall support analogue (jack) and digital (SIP) output modes for centralised system audio recording
- The system shall support unlimited channels for audio recording, only limited by system configuration and network bandwidth
- It shall be possible to backup complete server configuration from the system web page. The resulting file shall be time stamped and be easy to archive. The file shall contain the system network settings, the intercom configuration database, the last state of the system as a snapshot, a

record of all version numbers of software and any scripts or configuration files related to the running of the system. It shall be possible to optionally export the system event log included with the system backup operation.

- It shall be possible to recreate a system from scratch based solely on the data from the said system backup file.

ADVANCED SYSTEM FEATURES

- The system shall provide an **acoustic echo cancellation (AEC)** engine when used in full duplex mode to significantly reduce unwanted interference from acoustic reflections and feedback
- The system shall feature advanced **covert monitoring** capabilities whereby an operator (master) station with the appropriate permissions can covertly monitor (listen to) audio from any intercom terminal
    - While operating covertly the system shall disable any call-connected notifications (eg. Call LED) at the intercom terminal while restricting any audio from being transmitted to the intercom terminal allowing for optimal audio monitoring.
    - No audible or visual cue at the intercom shall indicate that the unit is being monitored.
    - If background music is selected, the intercom should operate as normal without muting or interruption should a covert monitoring session be initiated or stopped on the intercom.
    - While operating covertly the system shall use advanced acoustic echo cancellation to significantly reduce system-streamed background music from the monitored intercom microphone audio
    - While a covert monitoring session is in progress the intercom should be able to make a call and operate as normal without affecting the ongoing monitoring session.
- The system shall provide **threshold monitoring** whereby a call is automatically connected to or an alarm notification is activated should a

predetermined ambient noise level be exceeded at any configured intercom endpoint

- The system shall support control of general purpose inputs/outputs/repay outputs on intercom terminals or dedicated TCP/IP MODBUS relay module devices from system events
- The system shall be configurable to allow for the triggering of events in conjunction with an action performed in the intercom system. Event triggers include (but are not limited to) CCTV switching, light on/off switching, door/gate/boom gate release, pre-recorded message announcements, night switching (call diversion relating to hierarchy, based on time of day) and bell or warning alarm scheduling
- The system shall offer priority queuing of calls - offering 256 call priority levels
- Upgrading of system/endpoint firmware shall be achieved via the network with the ability to select all or singular endpoints to upgrade. Furthermore, if the upgrade was to fail all endpoints shall revert back to their previously working state
- System volume control shall:
    - Be centralised and software configurable for the entire system
    - Allow for individual device volume adjustments (absolute & relative) for all audio paths including calls, ringing chime, PA announcement chime, streamed music, microphone and button click
- All system devices shall have two UDP audio streams available at any time:
    - Call audio stream
    - Covert streaming for monitoring and threshold alarms
- The system, operating via high level interface to a third party building or security management system shall feature cached dynamic volume adjustment whereby volume changed dynamically will be reapplied the next time a device enters the same state. Therefore ringing volume can be

the same volume when a call starts to ring but can be dynamically altered when the call is ringing.

- System controllers shall be available for mounting as a virtual machine operating within a virtual hosting environment such as VMware VSphere(TM)
- It shall be possible for disk images of the operating system to be made available to system integrators to create virtual hosted servers.

AUDIO SPEGIFICATIONS

- G.711 16kHz A-Law Audio codec
- Intercom audio power: 2W
- Duplex modes: Full & Half
- Intercom audio bandwidth: 50 Hz- 7kHz
- Master intercom handset: Yes
- Master intercom PA microphone: Yes

CAPACITY

The intercom/PA system shall operate the following system capacity:

Master stations: Unlimited (provided network capacity and configuration are in spec)

Intercom terminals: Unlimited (provided network capacity and configuration are in spec)

Simultaneous conversations: Unlimited (provided network capacity and configuration are in spec)

Call queue size: Unlimited (provided network capacity and configuration are in spec)

PA zones: Unlimited (provided network capacity and configuration are in spec)

Groups: Unlimited (provided network capacity and configuration are in spec)

Stored announcements: Unlimited (provided network capacity and configuration are in spec)
Auxiliary channels: 16 or Unlimited (provided network capacity and configuration are in spec)

INTERFACE CAPABILITIES

- The system shall be capable of integrating via High Level Interface (HLI) to 3rd party building and security management, digital telephony, CCTV and access control systems
- Operating via HLI the system shall:
    - pass full intercom master functionality to the client application which includes receiving endpoint status changes, call notifications, basic and advanced call handling functions
    - allow the third party system to control the intercom and/or PA system through a 3rd party security/management system graphical user interface (GUI)
    - provide system reports and log data from endpoints for review, monitoring and maintenance purposes
    - In CCTV integration applications, automatically initiate a 3rd party associated display of camera video triggered from a call station's operation.
- The system shall interface to the PSTN or local PABX system through use of a phone line interface device
- The system shall interface to digital telephone systems via SIP by use of head end translation software

ENDPOINT FUNCTIONS

- Each IP intercom/PA device shall be uniquely identifiable by its own tag number allowing for complete call configuration and hierarchy control

PIJ 04 02 01 Standalone console Operator (Master) Station

Intercom operator (master) stations shall have the following functionality:

- Operate in both full and half duplex modes
- In full duplex mode, operate hands free communication once call is established or optionally use "Push to Unmute" feature for master end conversational privacy
- In half duplex mode, audio direction is controlled via the "Push to Talk" button.
- Ability to call any other master station or intercom terminal in the system
- Ability to configure call hierarchy and call structure to achieve peer to peer and hierarchical communications
- Auto remote feature:
    - If set, shall result in any call normally answered by the master station to be forwarded to the next available master station in the call hierarchy
    - shall result automatically when a call is unanswered at a master station, the call will be forwarded to the next master station in the call hierarchy
        - Ability to set call remote time (milliseconds) before call at master station is deemed unanswered and auto remote is initiated
    - can divert a call to a SIP enabled digital telephone system or external telephone if the master station at the top of the call hierarchy is set to auto remote
- Ability to isolate calls from nuisance callers initiated at an intercom terminal – isolated calls shall
    - be manually deisolated or
    - a global isolate time-out (milliseconds) can be configured
- With the appropriate priority, have the ability to intrude upon a connected call with an endpoint (master or intercom terminal), whereby:

  - the endpoint not included in the intrude call shall be placed on hold, and
  - once the intruding call disconnects, the original (intruded upon call) shall reconnect/come off hold
- Have the ability to selectively answer any call waiting within the call queue
- Have the ability to forward calls to any other master station
- Have the ability to access call history including Missed Call, Answered Calls, Outgoing Calls, Diverted Calls and Forwarded calls.
- Failure of a master station shall not affect the call capabilities of any other master station, intercom terminal or PA controller within the system. In the instance of a master station failure, all calls shall be automatically routed to the next master station in the call hierarchy.
- Master stations shall support Bridge configuration whereby an incoming call may ring and be answered by one of multiple masters. Any one of the configured master stations can answer the call and the call will be cleared from the collective list of calls. in order to fan out calls between multiple operators.
- Master station shall be available in a variety of versions including desk or wall mount with options for handset, gooseneck microphone or headset

PIJ 04 02 02 GUI based Operator (Master) station

The computer based GUI master station shall feature all functionality of IPM-360 master stations. They shall use a separate Ethernet based speaker/microphone audio device to the GUI machine and additionally:

- GUI stations shall have the ability to display the endpoints in tree view, single graphical map, or multiple graphical maps.
- Have the ability for creation and editing of custom map content integrated into the final GUI application to allow adjustments in the field.
- The GUI application shall recognise PNG formatted picture content for use as maps, submaps, icons and customer motifs.

- The GUI screen resolution shall be self-adjusting according to the screen hardware and run at up to 1080p resolution
- The GUI shall feature a touch screen and also optionally be controllable via a conventional optical mouse.
- It shall be possible to lay buttons onto the GUI screen which link to other submaps
- It shall be possible to lay text of any font size and location to be added to the map screens
- The icons for endpoints shall be adjustable in size and allow for custom image content
- The text for icons shall be configurable such that text style, size and custom descriptions other than system defined descriptors may be added.
- The GUI shall feature an option to password protect the editing function to prevent unauthorized tampering.
- It shall be possible for the GUI to control the covert recording of any number of system endpoints to dedicated recording hardware. The recording hardware shall feature a balanced audio output that is trunked to a monitoring room with a convertor for each recording channel where covert monitoring and/or recording of selected cells occurs. It shall not be possible for the covert recorded cell to receive audible or visual cues that recording is occurring.
- When the GUI is set to view endpoints as a list, it shall be possible to sort ad group endpoints based on their tag number, descriptor or immediate master.
- The GUI shall have configurable buttons for call control including answer next, end call, covert monitor, forward call, hold and Remote function. It shall be possible to add or remove any combinations of buttons.
- It shall be possible to integrate online help systems into the GUI.

- A password option shall be implemented to prevent closure of the GUI application. This password shall be separate to the editing password and shall be able to be disabled if not required.
- The GUI application shall be able to run on a Microsoft Windows operating system provided by others which is used for other purposes other than for the intercom/PA system.
- The GUI application shall also be able to run on dedicate Linux machine as provided by the intercom system vendor

PIJ 04 03 01 Audio Intercom Terminals

Specifically designed for the prison environment, audio intercom terminals shall:

- Act as a call point to a master station as defined in the call hierarchy
- Act as a duress call point to a master station as defined in the call hierarchy
- Operate hands free communication once call button is pressed and call is established
- Have an option that is vandal and water resistant, made from marine grade (316 type) stainless steel
- Have an option that is vandal resistant, made from (304 type) stainless steel
- Feature anti-ligature design elements (all types)
- Use a speaker array pattern of 1.6mm holes and chamfered edges
- Feature microprocessor technology with at least 16 MHz clock frequency, 4 Mb RAM, 4 Mb firmware/tone Flash and 1 Mb bootloader Flash.
- Make use of fail proof centralised firmware upgrades for all intercom endpoint devices. The implementation shall feature a non-volatile bootloader which is segregated from the main firmware upgrade code. The upgrading system shall be robust such that it can recover from any kind of interruption during the firmware upgrade process.

- Have an option of a "Self Test Button" (STB) – a mechanical call button that allows for the testing of the push button mechanism, acoustics and data communications remotely whereby diagnostic tests are logged and recorded on the system controller. Any tests reporting a test fail shall trigger an alarm within the system
- Feature at least 2 visual LED indicator colours visible on the front panel to provide visual reassurance. The LED shall flash quickly to indicate a call is waiting to be answered, remain on solid during a call, flash slowly when there is a communication fault to the server and remain off when the call state is idle.
- Have the option of at least two configurable dry contact relays as standard
- Have the option of terminals with a minimum of 4 fully configurable input buttons which can be configured to call different locations, act as volume controls, control music volume, cancel calls and trigger general system alarms and events via Event Controller software.
- Have the option of auxiliary music channel selection and volume control for in-cell entertainment/music distribution
- Have options for power/communications input including:
    - IEEE.802.3af Power over Ethernet (PoE)
    - Local power supply
- Intercom electronic circuitry shall feature a "watchdog timer" circuit to reboot the intercom if it freezes due to an external voltage surge, EMI or ESD event.
- Be surface or flush mounted
- Have optional rainhoods for additional weather protection
- Offer customised etching, speaker hole pattern or panel size
- Intercom terminals shall perform continuous tamper detection, integrity and diagnostic testing whereby unsuccessful tests shall activate a system alarm and record the event in a saved log

- The intercom shall have a mounting option that makes use of the current 4 point collar system used in the facility

PIJ 04 04 01 Public Address

The IP Public Address (PA) system shall:

- Provide dynamic grouping and static grouping of PA zones with no limit on the number of groups or the number of members within the group
- Include intercoms as a part of any PA Group
- Broadcast live or pre-recorded announcements to one, many or all PA zones
- Provide playback and recording of announcement files
- Offer audio input of live or pre-recorded audio sources
- Offer remote and pre-recorded announcement capabilities
- Offer time scheduled broadcast of live or pre-recorded announcement files

The IP PA interface shall:

- Produce audio signals to transmit to PA amplifiers
- Provide balanced an unbalanced audio outputs
- Mount to a Eurocard card frame or be mountable standalone enclosure

CONTACT & NON-CONTACT VISIT SYSTEMS

Non-Contact Visit

The Non-Contacts Visit (NCV) system shall:

- provide intercom devices in pairs (normally separated between a glass or Perspex barrier to separate prisoner and visitor) where each pair constitutes a booth
- record all audio communications that occur in all booths
- connect device pairs automatically (via a schedule) or through a management interface (NCV GUI)
- Make use of a dedicated NCV Server with the same specifications as the standard Intercom server

PIJ 04 05 01 Non-Contact Visit Operator (Master) Station

Management of the NCV system shall be via a dedicated non-contact visits system graphical user interface (NCV GUI) to be used by the supervising authority to perform various functions of the system including:

- Enable/disable a call in a booth
- Connect/disconnect a call in a booth
- Monitor a call in a booth
- Intrude on a call in a booth
- Call to any intercom endpoint in the system (visitor or prisoner)
- Make public address announcement to one, select or all endpoints/zones within the system
- Operate in multi-selection mode allowing for multiple enable/disable/connect/disconnect functions to be applied to many or all booths simultaneously
- Provide a count up timer for each booth connected in a call

PIJ 04 05 02 Non-Contact Visit Intercom Terminals

Intercom devices shall be available in the following configurations:

- NCV system intercom with handset shall:
    - operate full duplex communication
    - include a metal handset with stainless steel armoured cord
    - have a call LED indicator which is illuminated when a call is in progress
    - operate as an IEEE 802.3af Power-Over-Ethernet (PoE)

- NCV intercom terminal, no call button shall:
    - operate hands free
    - operate full duplex communication
    - be of stainless steel construction
    - operate as an IEEE 802.3af Power-Over-Ethernet (PoE)

PIJ 04 05 03 Contact Visit System Operator (Master) Station

The Contacts Visit (CV) system shall:

- provide covert monitoring devices to facilitate the recording, monitoring and intruding of prisoner communication discretely (a common environment is a room with meeting tables where covert monitoring devices are mounted in each table)

Management of the CV system shall be via a dedicated Contact Visits system Graphical User Interface (CV GUI) to be used by the supervising authority to perform various covert monitoring functions including:

- Monitor (listen) to any device
- Provide a count up timer for each device being monitored
- Provide recording output for all monitored call audio

PIJ 04 05 04 Contact Visit System Operator (Master) Station

The Contact Visits covert monitoring device shall:

- Shall be suitable for discrete mounting
- Shall feature a 50 Hz – 7 kHz microphone
- Shall operate full duplex communication
- Shall operate as an IEEE 802.3af Power-Over-Ethernet (PoE) device

PIJ 04 06 01 RECORDING

- The system shall interface call audio to third party recording devices including digital, SIP or analogue devices
- The system shall provide output recording for **at least** 32 simultaneous conversations
- The recording operation shall run automatically under the control of the intercom system controller
- Each master station (and/or each intercom terminal) in the system shall be assigned its own record output

- Call originator and call answer tag number, time, date and duration shall be defined for each call recorded
- Analogue recording interface shall encode call tag information using DTMF tones
- Digital (SIP) recording interface shall pass call tag information through the SIP data interface
- The system shall support exporting of intercom call audio and creating of an event trigger to a 3rd party system when a call is generated. The audio can then be recorded by a CCTV camera associated with the intercom.

PIJ 04 07 01 REPORTING

With respect to reporting, the system shall:

- constantly monitor each endpoint (including master stations, intercom terminals and PA controllers for their device state, reporting any change in device state as an alarm in the master station or reporting this alarm to the HLI for use within 3rd party security management systems
- have capability to generate periodic reports and logs for system use, load, activity and status
- perform self-acoustic testing of speaker and microphones of slave intercoms and report results
- provide logs of call activity via a web interface that is password protected
- provide detailed reporting and diagnostics, with results logged in a faults database including:
    - Power up diagnostics – at power up all system devices perform a range of self-tests & diagnostics to determine the operational status
    - Polling of modules – all modules are polled at regular intervals
    - Online/offline status
    - Tamper alarm
    - Mechanical button (STB) pass/fail status

- Acoustic testing of speaker and microphone – performed during a call or configured to run at predetermined intervals
- Button stuck alarm (All buttons)
- Button failure (Self Testing Button)

- Record and log all (or those configured) transactions on the intercom/PA system including:
  - Error report
  - Call activity
  - Intercom call tag and description
  - Time of call
  - Duration of call
  - Time call ended

PIJ 04 08 01 SYSTEM CONTROLLERS

With respect to system controllers, the system shall:

- Consist of at least one controller for central call control. The controller may be hardware form or virtualised
- be available in 32-bit and 64-bit versions
- If redundancy is required for the system, multiple hardware servers shall be positioned strategically around site to service zones which may be potentially isolated during a break in the network. The servers shall run redundancy management software to automatically control which server is the active server.
- Offer recording output via a central audio recording interface server. This shall support direct output of current intercom calls. The type of output shall be analogue jack type and/or Ethernet based SIP recording output which can be connected to a 3rd party digital voice logger
- If full duplex audio mode is used, an audio processing controller is required. This audio processor shall also support merging of recording output function internally. If this controller is also used for recording, the

server shall be a normal hardware (not virtualised) and it shall be available in 32-bit and 64-bit versions.

- If threshold alarms are required on the site, threshold monitor controllers (TRM) are required. Each shall handle at least 300 intercom endpoints. Multiple TRM controllers can be used on each site. It shall be available in a 64-bit version only.