AIMS
Airport Information Management Solutions
機場信息管理技術有限公司
A joint venture company of CAM and ADA

Request for Quotation / 報價請求

Subject:	Supply and Install of Perimeter Intrusion Detection System (PIDS)		
From/由:	Mr. Kim Wong / Patrick So	E-mail/電郵	kimwong@aims.com.mo
Tel/電話:	853-8598 8717 / 8898 2369	Fax/傳真:	853-8598 8711
Date/日期:	01-Feb-2019	Ref:	010-2019-Q

煩請按下列要求報價：

No.	Item / Model / Description	Qty.
1.	Supply and Install of Perimeter Intrusion Detection System - Requirement please refer to below; - Submission Deadline: 21st Feb 2019	1

Part A – Project Overview

1. Project Objectives

MIA is dedicated to providing the highest level and quality of the security and safety in Macau International Airport. In this light, MIA will operate a state-of-the-art Perimeter Intrusion Detection System (PIDS) to protect all of MIA's external perimeter. The PIDS will use video and thermal cameras, combined with Video Content Analysis (VCA) and a Fence Detection System to alert security operators at MIA of security breaches.

This project covers three of the PIDS sub-systems, namely, the Fence Detection System and the PIDS camera system and the PIDS Video Content Analysis (VCA) system.

The project objectives for this document is for the design, supply and installation of the PIDS camera system at the Airport as follows:

Supply and install external camera infrastructure, as described in this document:

- Thermal cameras in areas and locations designated in this document;
- All poles, mounts, and installation hardware;

- Data and power network for the new cameras;
- Configure the existing Video Management System (VMS) with the new cameras and existing cameras, and provide a video feed for each camera to the VCA server and VCA work stations;

And the PIDS Fence Detection System (FDS) at the Airport as follows:

Supply and install Fence Detection System, as described in this document:

- Detection cable sections;
- Field controllers for all of the fence sections;
- All clips, mounts, and installation hardware for the above equipment;
- Data and power connections and ducts from the demarcation points to the field equipment;
- Configuration and control software and hardware, including central controller or server, control software with all relevant licences including APIs and connectors;
- Configuration, calibration, and commissioning of the FDS.

And the PIDS Video Content Analysis (VCA) System at Airport as follows:

Supply and install VCA System, as described in this document:

- VCA system software;
- Connection and configuration to existing video management system (VMS);
- Configuration, calibration, and commissioning of the VCA;
- Connection to the Pelco VMS platform for alarm handling.

2. Submission Requirements

All designs submitted must be verified and signed by certified engineers with relevant qualification, wherever applicable.

MIA reserves the right to request additional information necessary and pertinent to the project so as to assure the bidder's ability and qualification to perform the Contract. The following list generally describes what the successful bidder is required to submit after award of contract.

Submission Log - This is a log file to track the status of document submission. The format of the file will be provided by the designated project supervision team after project kick-off meeting.

Design Drawing - All design drawings related to the PIDS camera system Project.

Method Statement – Document(s) describing detailed construction and equipment setup methodology of the PIDS camera system in every aspect.

Training Plan – Document(s) describing how the training and skill transfer will be performed.

Equipment Information – Information provided by equipment manufacturer describing the equipment that will be delivered in the project.

User Acceptance Trial Plan – Document(s) describing how the new PIDS camera system will be tested during the User Acceptance Test (UAT) Trial Period.

3. Design Principles

Safety and Reliability

The PIDS system construction and installation activities must respect working environmental safety and reliability standards. Contractor shall take have the duty to effect all work with reasonable caution, considering the PIDS layout, structural design, equipment selection, maintenance, and other factors.

Advanced Technical Design

Equipment and facilities shall adopt the latest technologies, and designs of the PIDS shall meet not only current needs but also taking into account the trends and requirements of the PIDS in the next 3 to 5 years.

Modern Appearance and Practicality

The technologies and design considered must conform to the latest technological advances and features currently on the market. Particular emphasis will be put on user-friendly interfaces and operation.

Scalability

Contractor shall take full account of PIDS flexibility and scalability for future expansion and upgrade. Equipment and facilities shall be expandable in a modular fashion.

Manageability

Centralized management capability shall be required for improving engineering work and Airport operation, hence reducing the maintenance workload and downtime.

Energy Saving and Environmental Protection

Contractor shall take full account of PIDS materials, systems and equipment to improve system efficiency and energy saving.

4. Site Rules and Traffic Rules

Successful bidder shall be required to follow the rules and regulations stated in the "Macau International Airport Site Rules and Traffic Rules" provided as attached files with this document. Attached files are listed in this document.

All technical works must be instructed by certified site instruction engineers of relevant fields.

Part B – Technical Requirements

1. Description

This Part specifies the design, manufacture, supply, installation, testing and commissioning of the PIDS camera, FDS systems, VCA systems and the performance requirements of the system.

Any item not specifically shown on the drawings or called for in the specifications, but normally required to conform to the intent as contained in these documents, are to be considered as part of the contract.

2. General Requirements

The Contractor shall be responsible for the design, supply, installation, wiring, testing and commissioning of a PIDS camera, FDS systems and VCA systems for the airport.

The work shall include all labour, materials and associated builder's works necessary to form the complete installation and all tests, adjustments, commissioning and maintenance. It shall include not only the major items of equipment shown or specified but all incidental components necessary for the complete execution of the works and for the full completion and commissioning of the whole installation.

The PIDS camera, FDS systems and VCA systems shall be designed, supplied and installed based on the most recent technology and sufficient spare capacity in order to avoid early obsolescence. This shall be balanced by a proven record of fault-free usage and also taking into account the factors of ease and economy of maintenance.

The contractor shall be responsible for the completion of the PIDS camera, FDS systems and VCA systems which are comprised of, but not limited to the following components:

- Poles, mounts, and brackets;
- Cameras;
- Lenses;
- Camera Housings and Mounting Hardware;
- Sensor cables;
- FDS controllers;
- Video/Control and Data Network equipment for the new cameras;
- Power and UPS Equipment;
- Earthing, Grounding and Lightning Protection Equipment;
- Ethernet IP Network Equipment, where required;
- Fibre Optic Cabling, where required;
- CAT6 Cabling;
- All configuration of network equipment.
- Server, Workstation and Storage
- Video Content Analysis (VCA) System

The contractor shall include the supply, installation, testing, testing report and commissioning of all cabling equipment for a new Local Area Network (LAN) for the dedicated use of the PIDS camera and FDS systems comprised of, but not limited to the following components:

- Category 6 4-pair (1G) UTP cable;
- Single and multi-mode fiber optic cable;
- Twisted pair cable;
- RJ45 jack plugs;
- Terminated and tested optical cable plugs;
- Cable connectors;
- Patch cables, leads and wires;
- Termination blocks/trays;
- Active network equipment.

The Contractor's scope of work shall include the following:

- Supply and installation of poles, mounts and brackets to mount the new cameras, FDS cables and field controllers;
- Supply and installation the power to the cameras, FSD cables and fields controllers;
- Supply and installation of all associated equipment and cabling of camera equipment;
- Supply and installation of FDS cables and control equipment;
- Supply and installation of control and signal cabling between camera and FDS equipment and other system demarcation points;

- Supply and installation of surge suppression and voltage regulation so as to protect the equipment from over and under voltage and surge/spikes;
- Supply and installation of lightning protection equipment where required;
- Identification, labelling, and inventory of all equipment, cables and connections;
- All required configuration and programming of new cameras into the VMS;
- Testing and Commissioning of the new cameras within the VMS;
- As-built drawings of the installed system;
- Supply and installation of the FDS control and command software, including APIs and connectors;
- All required configuration and programming of the FDS;
- Testing and Commissioning of the FDS;
- Testing and Commissioning of the API/SDK interface and acknowledgement of the messages in the other systems.
- Supply and installation of VCA software including APIs and connectors;
- Configuration and calibration of designated cameras;
- Configuration and calibration of VCA alarm and data transmission to existing PELCO Platform;
- Testing and Commissioning of the VCA software including UAT.

All equipment, instrument, appliance, control accessories, etc. provided shall be of the latest model for which replacement parts shall be available at least ten (10) years after completion of the two (2) years Defects Liability Period.

All equipment and materials of same type shall be the product of the same manufacturer. All similar items of equipment shall be interchangeable.

Sample(s) shall be provided for submission and all the proposed equipment must be submitted to the Employer or its designated supervision team for approval before ordering.

The Contractor shall be responsible for carrying out the testing and commissioning of the new cameras, FDS and VCA equipment to the satisfaction of the Employer and in accordance with the requirements referred to this specification. The Contractor shall provide all labour, equipment and materials for testing and commissioning of the camera system, FDS equipment and the whole installation.

MIA is a working international airport with extended hours of operations and subject to aviation regulations and restrictions. All work shall be done in designated working hours assigned by the Client, which may involve work outside of regular business hours. No extra cost claims by the Contractor are allowed for night work or interval working hours.

All wiring works, including the provisions of trunking/conduit systems and termination boxes (if necessary) shall be furnished and installed by the Contractor.

The following details shall be provided in bidders' responses, at a minimum:

- List of designated equipment;
- Coverage and delays for repair or replacement of various components based on the nature and severity of the non-conformity, defect or breakdown;
- Quotation of maintenance and support service plan within the Defect Liability Period (DLP);
- Quotation of the maintenance and support plan after the Defect Liability Period (DLP) five (5) years after the Commissioning and Acceptance of the PIDS camera system;
- Provision and up-to-date maintenance of as-built/as-installed documents and drawings for the PIDS system during the full two (2) year DLP period;
- Supply five (5) sets of relevant manuals, technical documents, handbooks and camera operation manuals in both English and Chinese versions;
- Supply of up-to-date relevant manuals, technical documents, handbooks and camera operation manuals in both English and Chinese versions in case of camera or equipment replacement during the five (5) year period.

The PIDS camera, FDS systems and VCA systems shall be provisioned with the equipment listed as the minimum standard. Meeting the minimum product standards and configuration standards do not necessarily imply the System Performance Requirements can be met. The Contractor shall provide additional equipment, enhanced standards, improved systems configuration to ensure the completed PIDS camera system shall meet the System Performance Requirements in this specification.

3.Camera, FDS Systems and VCA Systems Performance Requirements

Whole system down time – It is not allowed to have any instances that the entire new and existing systems need to be down entirely. Once the systems are connected to the end user, the system will need to be maintained continuously. The contractor shall need to maintain the system until the entire system is commissioned and handed over to the client. Provide one (1) dedicated qualified maintenance personnel full time (office hours) on site during the installation period when the new IP Cameras are connected to the IP CCTV system.

For the sake of skill transfer on the system faults troubleshooting and/or preventive and corrective

maintenance activity, the contractor shall need to provide one (1) dedicated qualified maintenance personnel full time (office hours) on site after the Provisional Acceptance for not less than 2 months.

IP CCTV system operation – The camera system shall be able to work in parallel with the existing CCTV system for an indefinite period of time for different cameras points. And all images of the cameras system shall be able to display in the existing CCTV System and store in the storage up to sixty days (60 days). Our existing CCTV system is Pelco VideoXpert System.

Individual camera down time – It is permitted to switch on progressively each new camera to the IP CCTV system. The cameras shall be switched over one by one or in groups during the migration period.

Operator terminal/console down time – It is not permitted to bring any operator terminal/console down during the migration.

The camera system shall provide low latency video with high quality images and support MPEG-4/Motion-JPEG/H.264 compression schemes simultaneously.

The CCTV system shall provide replication of individual video feeds at different frame rates for multiple users and other system processes.

The FDS system shall be installed and tested as a whole prior to becoming operational. The same requirements as for the above CCTV system are applicable to the FDS hardware and operation.

4.Camera System Material/Equipment and Cabling

The perimeter of MIA has been divided into three main areas that shall be used throughout this document, as well as for quotation purposes.

These areas are illustrated below:

- **Urban perimeter**, consisting of all perimeter areas that border on Macau's urban streets up to the River of Pearls shoreline. This area is deemed as presenting a high risk of breach;
- **Taxiway island perimeter**, consisting of the exterior-facing edges of the taxiways (Charlie and Hotel). These areas are deemed as presenting a high risk of intrusion;
- **Runway perimeter**, consisting in the exterior perimeter facing the River of Pearls, from the intersection with taxiway Charlie all the way to the intersection with taxiway Hotel. This area is deemed as presenting a low to medium risk.

A graphic illustration of the perimeter is provided below:

Illustration 1 MIA PIDS Perimeter Areas

Urban Perimeter New Cameras

In the Urban perimeter, cameras will be installed to provide single, continuous coverage of the fence and building front areas, with the exception of the main Terminal building.

The cameras will cover the entire length of the new Fence Detection System (FDS) which is based on a sensor cable that will run along the fence barrier sections, as illustrated below. The cameras will be staggered one behind the other to provide continuous single coverage of the areas in scope.

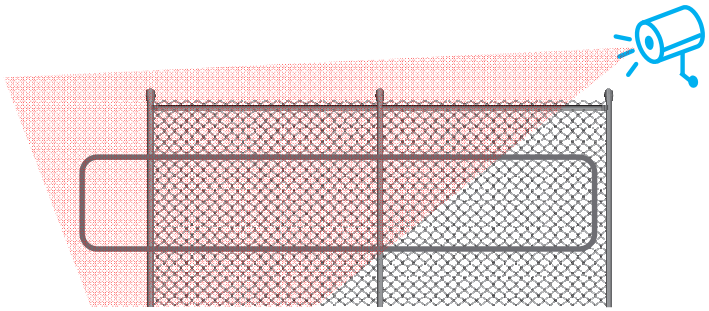

Illustration 2 Example of Fence, Cable Detection and Video Coverage (indicative only)

The cameras will be located in the following locations:

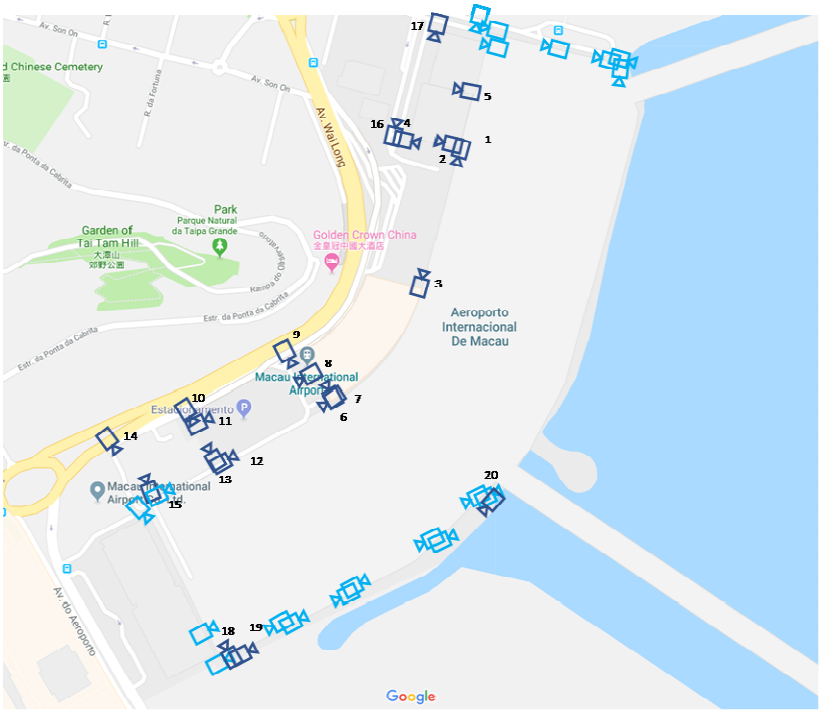

Illustration 3 Camera Locations on Urban Perimeter (indicative only)

The main thermal detection cameras to be supplied will have the following general characteristics. The angles, resolutions, orientation and lenses are based on the VCA software that is part of a different supply package. It is up to each bidder to detail the exact characteristics of each camera to be supplied. The Employer will then verify and approve the final camera characteristics based on the VCA requirements.

Camera	Brand	Model	Resolution	Lens	Height	Angle	Orient.	Status
MIA 1	TBA	Thermal	320x240	35 mm	5 m	-7°	163°	N
MIA 2	TBA	Thermal	320x240	35 mm	5 m	-7°	348°	N
MIA 3	TBA	Thermal	320x240	35 mm	5 m	-5°	69°	N
MIA 4	TBA	Thermal	320x240	35 mm	5 m	-5°	264°	N
MIA 5	TBA	Thermal	320x240	19 mm	5 m	-9°	303°	N
MIA 6	TBA	Thermal	320x240	19 mm	5 m	-9°	115°	N
MIA 7	TBA	Thermal	320x240	35 mm	5 m	-5°	23°	N
MIA 8	TBA	Thermal	320x240	35 mm	5 m	-5°	209°	N
MIA 9	TBA	Thermal	320x240	19 mm	5 m	-9°	296°	N
MIA 10	TBA	Thermal	320x240	19 mm	5 m	-9°	117°	N
MIA 11	TBA	Thermal	320x240	35 mm	5 m	-5°	117°	N
MIA 12	TBA	Thermal	320x240	19 mm	5 m	-9°	288°	N
MIA 13	TBA	Thermal	320x240	35 mm	5 m	-4°	163°	N

MIA 14	TBA	Thermal	320x240	35 mm	5 m	-5°	205°	N
MIA 15	TBA	Thermal	320x240	35 mm	5 m	-5°	23°	N
MIA 16	TBA	Thermal	320x240	35 mm	5 m	-7°	69°	N
MIA 17	TBA	Thermal	320x240	35 mm	5 m	-7°	348°	N
MIA 18	TBA	Thermal	320x240	35 mm	5 m	-7°	23°	N
MIA 19	TBA	Thermal	320x240	35 mm	5 m	-7°	288°	N
MIA 20	TBA	Thermal	320x240	35 mm	5 m	-7°	115°	N

In locations where there are no existing buildings, fences or poles, the cameras shall be installed on 5 m posts with frangible slip bases. Please refer to the Camera Mounting Equipment section for details on the pole characteristics. All other cameras shall be installed, where feasible, to existing infrastructure. Contractor may need to seek the permission from third parties if the infrastructure doesn't not belong to MIA directly (such as hangars, lighting posts, etc.) Bidders will detail for each camera where and how it is mounted and secured.

Taxiway Perimeter New Cameras

This area runs along the external perimeter of the causeway bridges that carry taxiways Charlie and Hotel. Because of aeronautical navigation regulations, camera mounting height is restricted to 400 mm height. Please refer to the Camera Mounting Equipment Specifications for further details.

Cameras will be mounted in a criss-cross pattern to provide double coverage of each and every section of the taxiways, as illustrated below.

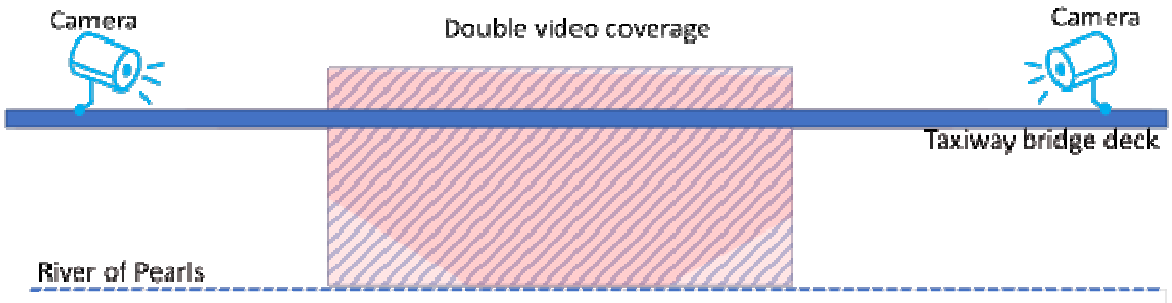

Illustration 4: Double Coverage on Taxiways (indicative only)

The cameras will be located in the following locations:

Illustration 5: Camera Locations on Taxiways (indicative only)

The main thermal detection cameras to be supplied will have the following general characteristics. The angles, resolutions, orientation and lenses are based on the VCA software that is part of a different supply package. MIA will then verify and approve the final camera characteristics based on the VCA requirements.

Camera	Brand	Model	Resolution	Lens	Height	Angle	Orient.	Status
MIA 1	TBA	Thermal	320x240	60 mm	0.4 m	0°	200°	N
MIA 2	TBA	Thermal	320x240	60 mm	0.4 m	0°	20°	N
MIA 3	TBA	Thermal	320x240	60 mm	0.4 m	0°	199°	N
MIA 4	TBA	Thermal	320x240	60 mm	0.4 m	0°	148°	N
MIA 5	TBA	Thermal	320x240	60 mm	0.4 m	0°	327°	N
MIA 6	TBA	Thermal	320x240	60 mm	0.4 m	0°	145°	N
MIA 7	TBA	Thermal	320x240	60 mm	0.4 m	0°	327°	N
MIA 8	TBA	Thermal	320x240	60 mm	0.4 m	0°	148°	N
MIA 9	TBA	Thermal	320x240	60 mm	0.4 m	0°	327°	N
MIA 10	TBA	Thermal	320x240	60 mm	0.4 m	0°	20°	N
MIA 11	TBA	Thermal	320x240	60 mm	0.4 m	0°	199°	N
MIA 12	TBA	Thermal	320x240	60 mm	0.4 m	0°	327°	N
MIA 13	TBA	Thermal	320x240	60 mm	0.4 m	0°	148°	N
MIA 14	TBA	Thermal	320x240	60 mm	0.4 m	0°	148°	N
MIA 15	TBA	Thermal	320x240	60 mm	0.4 m	0°	148°	N
MIA 16	TBA	Thermal	320x240	60 mm	0.4 m	0°	148°	N

Runway Island Perimeter New Cameras

On the Runway Island, camera will provide continuous single coverage of the external perimeter bordered either by the seawall fronting the River of Pearls and inner channels. The cameras will be installed in a continuous line where each camera covers the base of the following or preceding camera so as not to create any blind spots, as illustrated below:

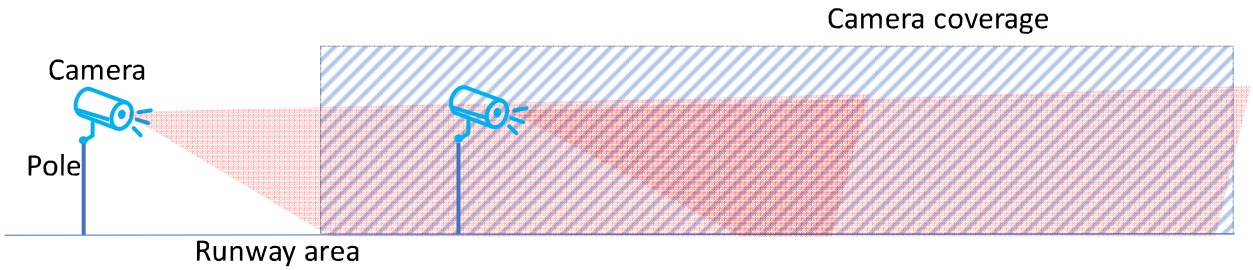

Illustration 6 Continuous coverage on runway island area (indicative only)

The cameras will be mounted on 1000 mm poles. Please refer to the Camera Mounting Equipment Specifications for further details.

The cameras will be located in the following locations:

Illustration 7 Camera Locations on Runway Island (indicative only)

The main thermal detection cameras to be supplied will have the following general characteristics. The angles, resolutions, orientation and lenses are based on the VCA software that is part of a different supply package. MIA will then verify and approve the final camera characteristics based on the VCA requirements.

Camera	Brand	Model	Resolution	Lens	Height	Angle	Orient.	Status
MIA 1	TBA	Thermal	320x240	35 mm	1 m	-5°	96°	N
MIA 2	TBA	Thermal	320x240	35 mm	1 m	-5°	285°	N
MIA 3	TBA	Thermal	320x240	35 mm	1 m	-5°	23°	N
MIA 4	TBA	Thermal	320x240	35 mm	1 m	-5°	3°	N
MIA 5	TBA	Thermal	320x240	35 mm	1 m	-5°	303°	N
MIA 6	TBA	Thermal	320x240	60 mm	1 m	-2°	288°	N
MIA 7	TBA	Thermal	320x240	60 mm	1 m	-2°	288°	N
MIA 8	TBA	Thermal	320x240	60 mm	1 m	-2°	288°	N
MIA 9	TBA	Thermal	320x240	60 mm	1 m	-2°	288°	N
MIA 10	TBA	Thermal	320x240	60 mm	1 m	-2°	288°	N
MIA 11	TBA	Thermal	320x240	60 mm	1 m	-2°	288°	N
MIA 12	TBA	Thermal	320x240	60 mm	1 m	-2°	288°	N
MIA 13	TBA	Thermal	320x240	60 mm	1 m	-2°	288°	N
MIA 14	TBA	Thermal	320x240	60 mm	1 m	-2°	288°	N
MIA 15	TBA	Thermal	320x240	60 mm	1 m	-2°	288°	N
MIA 16	TBA	Thermal	320x240	60 mm	1 m	-2°	288°	N
MIA 17	TBA	Thermal	320x240	60 mm	1 m	-2°	288°	N
MIA 18	TBA	Thermal	320x240	60 mm	1 m	-2°	288°	N
MIA 19	TBA	Thermal	320x240	60 mm	1 m	-2°	288°	N
MIA 20	TBA	Thermal	320x240	60 mm	1 m	-2°	288°	N
MIA 21	TBA	Thermal	320x240	35 mm	1 m	-5°	291°	N
MIA 22	TBA	Thermal	320x240	35 mm	0.4 m	-5°	236°	N
MIA 23	TBA	Thermal	320x240	35 mm	0.4 m	-5°	197°	N
MIA 24	TBA	Thermal	320x240	35 mm	0.4 m	-5°	194°	N
MIA 25	TBA	Thermal	320x240	35 mm	0.4 m	-5°	160°	N
MIA 26	TBA	Thermal	320x240	60 mm	0.4 m	0°	109°	N
MIA 27	TBA	Thermal	320x240	60 mm	0.4 m	0°	109°	N
MIA 28	TBA	Thermal	320x240	60 mm	0.4 m	0°	109°	N
MIA 29	TBA	Thermal	320x240	60 mm	0.4 m	0°	106°	N
MIA 30	TBA	Thermal	320x240	60 mm	0.4 m	0°	145°	N

All Perimeters Existing Cameras

Bidders will provide services to configure 20 existing cameras in MIA's Pelco VideoXpert system. These cameras are already installed and connected and are illustrated in light blue on the preceding camera locations maps (illustration 3).

These cameras will also be connected to the VCA system and appropriate services will be provided by bidders to this effect, including testing and commissioning.

5.Camera Specifications

The following section describes the camera specifications for each location.

Thermal Camera Specifications

Thermal cameras shall meet the following minimum criteria:

Imager/Processor Specifications

- Uncooled Microbolometer Sensor
- Spectral band: 8 – 13.5 µm
- Sensitivity (NEDT): <50-70 mK
- Resolution: 320 X 240 pixel array

Video Stream Characteristics

- H.264 (MPEG-4 Part 10)
- Motion JPG
- Frame rate 8.3 to 25/30 fps
- At least two separate and individually configurable video streams, including quality, frame rate, and compression settings
- OnVIF compatible

Image controls

- Standard controls such as brightness, sharpness, contrast, exposure, etc.
- Overlays: text, image, privacy masks. These must all be individually user programmable
- Electronic image stabilization

Lenses

Different lenses will be required based on the location, angle and field of view required. Bidders will consult the attached tables for the required lens sizes. Bidders may suggest different sizes and characteristics by providing written justifications detailing their calculations based on the focal length, field of view, size of objects to be covered, and area to be covered.

All lenses provided shall either be provided as OEM (Original Equipment Manufacturer) supply from the camera manufacturer or shall be sourced from a reputable specialized lens manufacturer. Minimal specifications for the lenses shall be those of the OEM supply, or the equivalent specifications from manufacturers such as Canon, Tamron, Fujifilm, or Tokina. Bidders must list the specifications and warranty information in their offers.

Network

- Ethernet port: RJ45
- Throughput: 10/100 Mbps
- Video: RTP/RTSP Unicast/Multicast
- Alarms and commands: TCP/IP, HTTP
- IEEE 802.1x Authentication

Security

- Password protection
- IP address filtering
- HTTPS encryption

Supported Protocols

- IPv4/v6, HTTP, HTTPS, SSL/TLS, QoS Layer 3,
- FTP, CIFS/SMB, SMTP, UPnPTM, SNMP v1/v2c/v3 (MIB-II), DNS, DynDNS, NTP, RTSP, RTP, SRTP, SFT
- Open API for software integration
- OnVIF Profile S and Profile G

Configuration

Configuration tools must be web-based and hosted directly on the camera. All settings must be accessible using a standard web browser. No external software shall be required. Configuration access shall support security measures such as password protection and encryption.

Electrical

- Power Requirements: PoE (802.3af), PoE+ (802.3at), 12VDC, 24VAC
- Power Consumption <12.95 Watts
- I/O connector for AC or DC input

Environmental:

- Operating temperature: -50 C to 70 C
- Storage temperature: -50 C to 85 C

- Relative Humidity: 0-95%
- Humidity tolerance: per MIL-STD-810G method 507.5 procedure 2
- Salt fog tolerance: No damage caused exposure to salt fog per MIL-STD-810G, Section 509.4 (5 cycles).
- Protection for dust and water: System sealed to IP66 and/or IP67
- Vibration tolerance: per MIL-STD-810G "Transportation"
- Shock tolerance: per ISTA 1A

Certifications:

- Electromagnetic Compatibility: CE (main EN categories, listings required)
- Environmental: IP66, IP67; IEC 60068-2-1:2007; IEC 60068-2-2:2007; IEC 60068-2-27:2008; ISTA-1A; MIL-STD-810F or G (provide listing of methods used)
- Material: RoHS Directive 2011/65/EU; WEEE 2012/19/EU

Export Regulations:

If the particular camera model is subject to export regulations, it is the bidder's responsibility to verify these regulations, submit, obtain and manage all permits and ensure the timely arrival of the cameras. Any costs associated with the management of the permits will be borne by the bidder.

6.Camera Mounting Equipment Specifications

Cameras will be mounted in a variety of ways depending on the area they are located in. Each bidder will state what type of mounting it will include for each camera location and each option.

For each camera, regardless of the mounting method chosen, each bidder will specify which lightning protection measures they recommend and install. This will be specified for each mounting type (poles, brackets, suspensions, etc.).

For each mount type proposed (poles, brackets, suspensions, etc.), each bidder will provide details regarding what treatment and materials will be used for all of the components. The mounts must be able to resist winds as described below:

Height	V_s Serviceability	V_u Ultimate
3-5 m	30 m/s	60 m/s

Where V_s refers to operating speed with no or little vibrations present allowing the cameras to operate normally, and V_u refers to the maximum designed wind resistance. Wind resistance will be calculated using a rated tip load of 25kg (eg, cameras and mounting hardware) with a surface of $0.15m^2$.

Poles shall have frangible bases to allow them to break in case of impact with a moving object or vehicle. The frangible bases shall be of the slip base type designed to break apart when impacted. The base pole adapter will use three bolts, washers and shear washers, and an electrical disconnect mechanism, as illustrated below, or an equivalent design. All surface/ground mounted cameras exceeding 1.5m shall conform to this design. Cameras mounted to walls or existing structures are excluded.

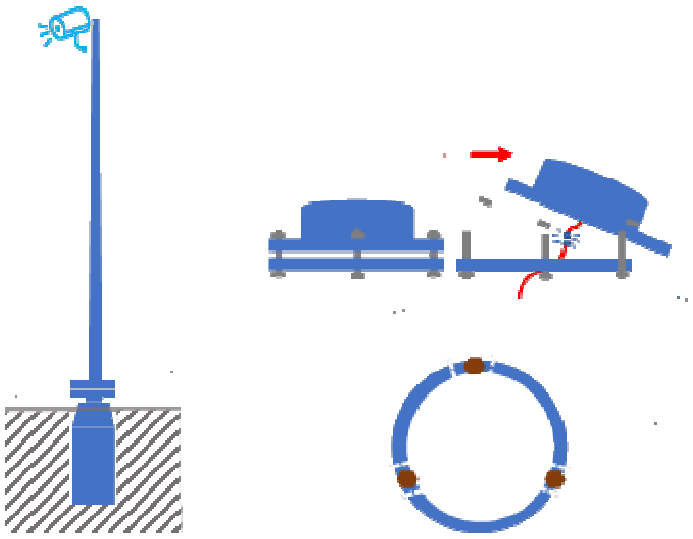

Illustration 8: Mounting Pole Elevation and Detail of Slip Flange and Breakaway Washer (indicative only)

All brackets shall be weather and humidity-resistant and will be designed for use in a high salinity environment. Poles and mounts shall be made of hot dip galvanized steel with the following characteristics:

Item	Steel Grade (minimum)	Steel Thickness (minimum)
Pole base slip plate mount	250 MPa	3 mm
Pole slip base	250 MPa	3 mm
Pole	250 MPa	3 mm

Bolts and associated nuts will be galvanized M36 grade.

Each pole and mount shall have a weather-resistant identification nameplate with the following information:

ID	MIA 1
Type	MIA Pole 1
Mfr name	Pole Co.
Mo/yr of fabrication	10/2018
Mass	150 kg
Height	3000 mm

Illustration 9 Information Plate for Equipment (indicative only)

Bidders shall supply detailed fabrication drawings for all mounting equipment which shall be reviewed and approved by the Employer or its designated representative prior to acquisition/fabrication.

Urban Perimeter Area

In the Urban Perimeter Area, cameras will be mounted at a 5000 mm height using either new or existing poles or other means of support, such as buildings, fences, columns, etc. Each bidder shall indicate how and where each camera in this area will be mounted.

Bidders will be responsible for the supply and installation of all mounting hardware and all new poles or supports, which will be approved by MIA or its designed representative prior to acquisition. Shop and fabrication diagrams, as well as ground elevation diagrams will be provided for these items so that they may be approved by MIA prior to acquisition/fabrication. All drawings and fabrication documents shall be reviewed and approved by a DSSOPT Certified engineer.

Taxiway Area

Bidders will supply all new camera mounting equipment in this area as described below.

Because of height restrictions in the causeway area due to aircraft navigation requirements, the cameras will be installed on the side of the causeway using pivoting arms as illustrated below. It shall be the responsibility of the bidders to provide the arms and detailed shop drawings and specifications. The arms shall be designed to pivot toward the causeway so that maintenance tasks on the cameras can be performed without the need for fall-restraint safety equipment.

The maximum vertical height of the camera and bracket shall not exceed 400 mm from the causeway deck. There is no restriction regarding the horizontal length of the brackets (eg, distance between the camera and the causeway edge). Bidders will determine and propose the best length based on their experience and the required parameters. It is mandatory that the brackets have positive/active and safe locking mechanisms to hold them in their operational (down) position to inhibit a camera from accidentally flipping up and damaging passing aircraft. The mechanism must be able to resist winds as described in the V_s and V_u parameters.

The bidders will ensure that the brackets provide a stable, vibration-free operation for the cameras under normal (V_s) operational conditions. Each bidder will provide written and graphical information explaining how this will be achieved, which are part of the shop and fabrication drawings.

Bidders will also supply recommended spare parts and details regarding materials used, suitability for marine environments, strength and resistance data, locking mechanism and safety catches, as well as rigidity of the structure as VCA requires stable images.

To economize on brackets, two cameras may be mounted to the same bracket, provided the bracket respects the requirements above.

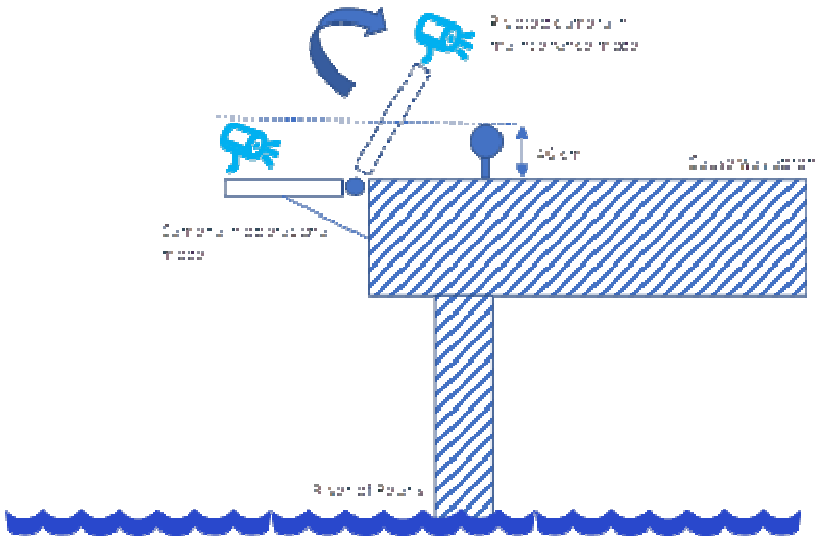

Illustration 10 Taxiway Camera Mounting Bracket

(Functional Schema, not intended for fabrication – indicative only)

Bidders will be responsible for the supply and installation of all mounting hardware and all new poles or supports, which will be approved by MIA's engineering and maintenance staff prior to acquisition or fabrication. All drawings and fabrication documents shall be reviewed and approved by a DSSOPT Certified engineer.

Runway Island Area

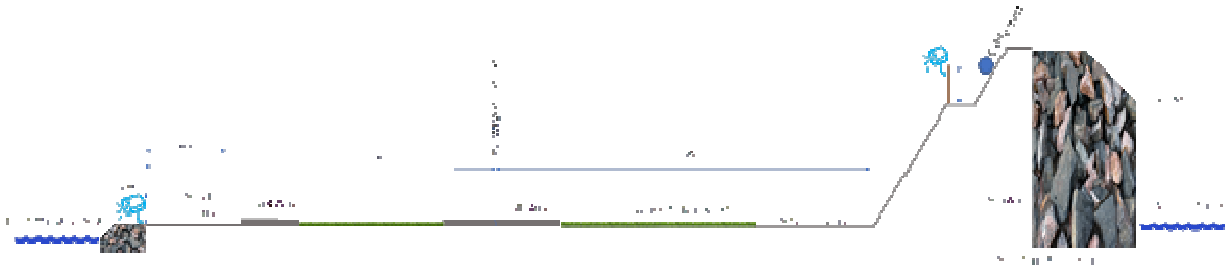

Illustration 11 Runway Cross-Section for Camera Mounting Poles (indicative only)

Bidders will provide and install mounting brackets for the cameras located on the inner harbour side. Shop and fabrication diagrams, as well as ground elevation diagrams will be provided for these cameras so that them may be approved by MIA.

Bidders will provide poles and mounting equipment on the seawall side of the runway island based on the following specifications. Shop and fabrication diagrams, as well as ground elevation diagrams will be provided for these cameras so that they may be approved by MIA.

7.Cabling and Power Specifications for Camera and FDS Systems

MIA will provide 220V power source and network access at the locations detailed in the following illustration:

Illustration 12 Data and Power Demarcation Points (indicative only)

Bidders will be responsible for providing and installing adequate cabling for the communications and power requirements of the camera system from the demarcation points all the way to each camera location.

Bidders will provide drawings of the cable paths to be used from the network and power access points all the way to each camera. Bidders will determine the preferred cable type for each location to provide the most economical and effective connectivity. Preferred cabling will be either structured network copper cabling or optical fiber. Power will be supplied using Power over Ethernet (PoE) switches or injectors, as required by each location.

All cameras will be connected to an Uninterrupted power Supply (UPS) guaranteeing at least 30 minutes of continuous operation after the mains power loss.

For all externally installed cable of any type that are in an area with no vehicular or pedestrian circulation, bidders shall provide and install plastic rigid conduit, such as vinyl-based and/or HDPE pipes, elbows, fittings, junctions, mounting, and anchoring hardware. Minimal requirement shall be based on Schedule 80 Nominal Pipe Size (NPS) according to ASME (American Society of Mechanical Engineering).

For all externally installed cable of any type that are in an area with vehicular or pedestrian circulation, bidders shall provide and install metallic rigid conduit that is cut, impact, and tamper proof.

All materials supplied shall be weather- and corrosion-resistant. All conduit tubes and accessories shall be UV-resistant and water tight, including temporary submersion. If mounted on concrete or similar surfaces, all holding screws or bolts shall be anchored using plastic expansion plugs and sealed with weather resistant filler. Black or dark-coloured piping and fittings shall not be accepted.

All conduits shall be sealed with appropriate seals and/or glue, as required, to provide a frictionless, dry and dust-free environment for the cables. Junction boxes shall be installed at regular intervals to simplify maintenance, service, and repairs. All boxes shall have metal fasteners with weather sealed lids.

Conduits shall have at least 50% free space to ensure smooth pulling and a tension- and pressure-free disposition of the cables.

Different areas will require different conduit path and mounting solutions. Bidders shall propose the best cable path and mounting solution prior to installation to MIA or its designated representative for approval.

There is no preferred pathway in the Urban perimeter area.

In the taxiway area, all conduits and associated equipment shall be mounted on the vertical side of the causeways, as illustrated below:

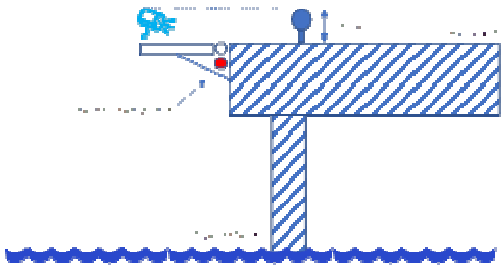

Illustration 13: Data and Power Conduit on Taxiway Causeway (indicative only)

In the runway island area, there are two preferred mounting methods. Please note that no conduit run may be surface-mounted in areas where there is vehicular or pedestrian traffic. Concrete covered trenching will be required in those areas (eg, road or path crossings, etc.)

In the seawall area, conduits shall run along the vertical portion of the seawall, as illustrated below:

Illustration 14 Data and Power Conduit on Seawall (indicative only)

In the south taxiway area, conduit shall be mounted on the outer edge of the service road, behind the camera mounts.

Illustration 15 Data and Power Conduit along Taxiway on Runway Island (indicative only)

Uninterrupted Power Supply Unit (UPS)

The Uninterrupted Power Supply Unit (UPS) shall consist of a battery power source, charger, AC output

inverter system, and automatic load transfer circuits for fully automatic operation.

The UPS shall be an on-line type UPS. When normal AC power returns, the UPS shall transfer the load to the rectifier output. At this time the charger shall turn on to its "high" charge position until the batteries are recharged to 80% of their rated capacity, then automatically switches to its maintenance "sensing" position to keep the batteries in their best full-charge condition. The total recharge time shall be less than 24 hours.

Two pilot lights shall be located in the front operating panel. One pilot light indicates that incoming AC power is available; the other pilot light indicates that the UPS is in the ready or standby mode.

The battery system shall be of totally enclosed sealed lead-acid type, separate from, and independent of, other battery systems, capable of operating all of the cameras at 100% full load condition for a period of 30 minutes. The lead-acid type battery cell shall comply with BS 6290 Part 4.

Should the emergency outage of line power exceed the maximum operation time of the UPS, there shall be no resultant damage. When the UPS's maximum duty cycle is exceeded, automatic shutdown shall occur.

All UPS units to be located in the field (if required) shall be housed in locked, weather-proof boxes to be installed at least 50 cm above the nearest ground level. Housings shall be IP55 or better and the materials and coatings used shall resist corrosion and UV damage. Adequate ventilation will be provided for proper battery venting.

UPS shall include a monitor module and support web-based network DO management, SNMP v1/v2/v3 protocol.

Category (CAT) 6 UTP, 4-pair

All Category 6 cable shall satisfy or exceed the performance requirement of category 6 of the ANSI/EIA/TIA-568B standard when installed in a channel configuration as defined in TIA-568B Part 2. The requirements of these standards shall be satisfied for the channel, permanent link and all components. Category 6 cables shall meet or exceed the specifications as outlined in the TIA/EIA-568-B-2 Transmission Performance Specification for 4 pair 100Ω category 6 cabling.

UPT cables shall extend between the network outlets and their associated IDF and consist of 4 pair, 22-24 AWG, Unshielded Twisted Pair and shall terminate on 8pin modular jacks provided at each outlet.

The 4 pair Unshielded Twisted Pair cable shall be UL Listed, and shall meet or exceed the electrical

specification listed below:

Mutual Capacitance	4.4nF/100m
Characteristic Impedance	100Ω ± 15% (0.772-100MHz) 100Ω ± 22% (100-200MHz) 100Ω ± 32% (200-500MHz)
DC Resistance	9.4Ω / 100m

Frequency	Worst Pair Attenuation (Max db/100m)	Worst Pair Power Sum NEXT (Max db/100m)
1.00MHz	2.0	72.3
4.00MHz	3.8	63.2
10.00MHz	6.0	57.3
16.00MHz	7.6	54.2
20.00MHz	8.5	52.7
31.25MHz	10.7	49.8
62.50MHz	15.5	45.3
100.00MHz	19.9	42.3
155.52MHz	25.3	39.4
250MHz	33.0	37.7

All cables shall comply with low smoke zero halogen (LSZH) requirements and IEC 60332-1-2, IEC 60754-2 and IEC 61034 standards.

Fiber Optic Cables

Fiber optic cable shall be provided as the backbone of the data communication network.

All fiber in a cable run shall be from the same manufacturer and shall be the same type. A mix of fibers from different manufacturers may not be used without written permission.

Multimode Fiber Specifications:

a) All fiber optic cables within the premises shall use multimode, graded-index fibers with 50 or 62.5 micron cores only unless stated otherwise.
b) Fibers must comply with EIAMA 492 specification and ISO 11801 standards.
c) Fibers shall have dual wavelength capability; transmitting at 850 and 1300nm ranges.

d) All fibers shall be colour coded to facilities individual fiber identification. Fibers shall be coated to ensure colour retention, minimize micro-bending losses and improve handling. The coating shall be mechanically strippable.
e) Fibers shall comply with ITU-T recommendation G.652 and FDDI specification. 50/125µm fibers shall comply with ITU-T G.651 and IEC 793/25 specifications. 62.5/125µm fibers shall comply with IEC 793/2 and FDDI specifications.

Core	62.5µm±3µm	50µm±2µm
Core Non-Circularity	<6%	<6%
Core/Cladding	<3.0µm	<3.0µm
Numerical Aperture	.275±0.015	002±0.015
Cladding Diameter	125µm±1.0µm	125µm±1.0µm
Cladding Non-Circularity	< 2.0%	< 2.0%
Colored Fiber Diameter	250±15µm	250±15µm
Buffering Diameter	890µm±50µm	890µm±50µm
Minimum Tensile Strength	100,000psil	100,000psil
Fiber Minimum Bending Radius	0.75in (1.91cm)	0.75in (1.91cm)
Cable Minimum Bending During installation After installation	 20 X cable diameter 10 X cable diameter	 20 X cable diameter 10 X cable diameter
Operating Temperature	0℃to 50℃	0℃to 50℃
Storage Temperature	-40℃to 65℃	-40℃to 65℃
Maximum Fiber Loss	3.4dB/km at 850nm 1.0dB/km at 1300nm	3.5dB/km at 850nm 1.5dB/km at 1300nm
Minimum Bandwidth	200MHz at 850nm 500MHz at 1300nm	Overfilled: 500MHz at 850nm 500MHz at 1300nm Laser: 2200MHz at 850nm 2500MHz at 1300nm

10Gb/s, 50.0/125µm Multimode Guarantee Channel Performance

a) The 50.0/125µm fiber channel shall support single-channel serial transmission in the building riser to 10 gigabits per second (Gb/s) for a distance of 300 meters with 4 connections.
b) The 50.0/125µm fiber channel shall be backward compatible with legacy applications such as Token Ring, FDDI, Fast Ethernet and ATM for in-building network distances ensuring a smooth migration path from 10Mb/s to 10Gb/s using achievable technology.

c) The channel shall support 10Gb/s short wavelength (850nm) emerging technology applications using vertical cavity surface emitting lasers (VCSELs) and low bit rate LED applications for legacy systems.
d) The 50µm fiber shall be optimized to control different mode delay (DMD) so that "pulse splitting" at 10Gb/s is eliminated.
e) The high-performance fiber shall use the same termination and test procedures that are currently used for existing industry's lower performance 50µm fiber.
f) A single manufacturer shall manufacture the 50µm fiber, 50µm fiber connectors, 50µm patch cords and apparatus, which comprise the channel.
g) The 50µm fiber shall meet and exceed the following standards, as applicable, for OSP or Plenum cables: ICEA S-83-596, ISO/IEC-794, GR-409, EIA/TIA 455, EIA/TIA 492, EIA/TIA 568-B, ANSI-FDDI, IEEE 802, UL 910, OFNP classification as describe in the national electric code (NEC2), OFN-LS low smoke zero halogen cables, CSA Certified (OFNFT4/FT6) and IEC 60332-1-2, IEC 60754-2 and IEC 61034 standards.
h) The manufacturer shall warrant the 10Gb/s channel's cables, components, and applications for a period of 15 years or more.
i) All cables shall comply with low smoke zero halogen (LSZH) requirements and IEC 60332-1-2, IEC 60754-2 and IEC 61034 standards.

Single Mode Fiber Specifications:

a) Fiber must comply with EIA/TIA 455 and IEC 793 test methods for the required attributes.
b) Fiber must comply with ITU-T recommendation G.652.
c) All fiber shall be color coded to facilitate individual fiber identification.
d) Fiber shall be coated to ensure color retention, minimize micro-bending losses and improve handling. The coating shall be mechanically strippable.
e) All cables shall comply with low smoke zero halogen (LSZH) requirements and IEC 60332-1-2, IEC 60754-2 and IEC 61034 standards.

Cladding Diameter:	125µm±1.0µm
Cladding Non-Circularity	< or = 1.0%
Coloured Fiber Diameter:	250±15µm
Core Diameter	8.3µm
Index of Refraction	0.37%
Core/Cladding Concentricity	< or = 0.8µm
Minimum Proof Strength	100,000 psi
Maximum Attenuation	0.4dB/km at 1310nm 0.3dB/km at 1550nm

Network PoE Switches, Midspan Injectors, and Transceivers

Network Switch

The switches shall comply with the following specifications:

- The network architecture should be hierarchical network design, including access, distribution, and core layers and no single point of failure.
- 24 ports 10/100/1000M Base-TX RJ-45 ports and 2mini GBIC 1000Base-SX/1000Baes-LX for high speed uplink and come with 2 1000Base-T stacking modules.
- The switching capacity of one unit should be not less than 36Gbps, and the throughput should not be less than 38.7 Mpps.
- If smaller units are required (less than 24 ports), equivalent performance shall be supported on a per-port basis.
- Should support wire-speed transmission on all ports.
- The MAC address table size should be not than 6K.
- Should support IEEE802.1Q VLAN, the VLAN number should not be less than 4K.
- Should have at least 8 hardware-based queues on each port, or the equivalent number for smaller units (less than 24 ports).
- Should support DHCP relay Option 82, DHCP Server Option 184, DHCP snooping, DHCP accounting, provides DHCP Server.
- Should support GVRP (GARP VLAN Registration Protocol), and VLAN VPN (QinQ).
- Should support Static Routing Protocol and RIP Version 1&2.
- Should be stackable (not cascaded) using multi-mode fiber or single-mode fiber so that switches located at different far away (>50meter) sites can be stacked together and can be managed by one single IP address as one unit.
- The switch should be stacked with daisy chain so that one back-up stacking path will be active automatically in case one master stacking path failed.
- Should support per port ACL (access-control list) based on time-setting, source and destination MAC address, IP address and TCP/UDP ports.
- The ACL should support both inbound direction and outbound direction.
- Shall use 802.1x authentication device and local authentication server so that end user can use remote radius server or local switch to implement 802.1x authentication; 802.1x PEAP, 802.1x –trusted MAC address, Centralized MAC address authentication.
- Should support FTP/TFPT to download/upload software image for software upgrade.
- Should support Strict Priority (SP), Weighted Round Robin (WRR), Weighted Fair Queuing (WFQ), SP+WRR and SP+WFQ; 8priority queues and 2 drop precedence; WRED congestion avoidance algorithm and port traffic shaping.
- Should support IEEE802.1d, 802.1w and 802.1s spanning tree protocol.
- Should support SSH 2.0, configuration through CLI, web-based network management, SNMP v1/v2/v3 (simple network management protocol).

- Duty and redundant power supply shall be required.

PoE and Midspan Injector

- The Power over Ethernet (PoE) shall be PoE+ compliant according to IEEE 802.3at
- It shall provide at least 25.5W of power at each port.

Optical Signal to Ethernet Transceiver

The transceiver units shall be used to convert optical data streams into ethernet copper streams and vice-versa. The units used shall be an enhanced small form factor pluggable SFP+ device type based on SSF-8431.

The transceivers shall support standard digital diagnostics monitoring (DDM) functions so that MIA may monitor optical output and input power, temperature, laser bias current, and supply voltages in real time. The supplied units will include a DDM/DOM interface software.

The optical portion of the transceiver shall have a minimum 10 Gbps rating, while the copper portion shall have a minimal 1 Gbps rating.

8. FDS Material/Equipment and Cabling

The FDS is one of three components of the PIDS. Its function consists in providing a first-line layer of detection to pinpoint attempted intrusions or break-ins along MIA's perimeter fence.

The second line of detection along the fence will be provided and correlated with the VCA system, where video camera feeds will trigger intrusion alarms in the same coverage areas as the FDS, providing a double coverage as illustrated below:

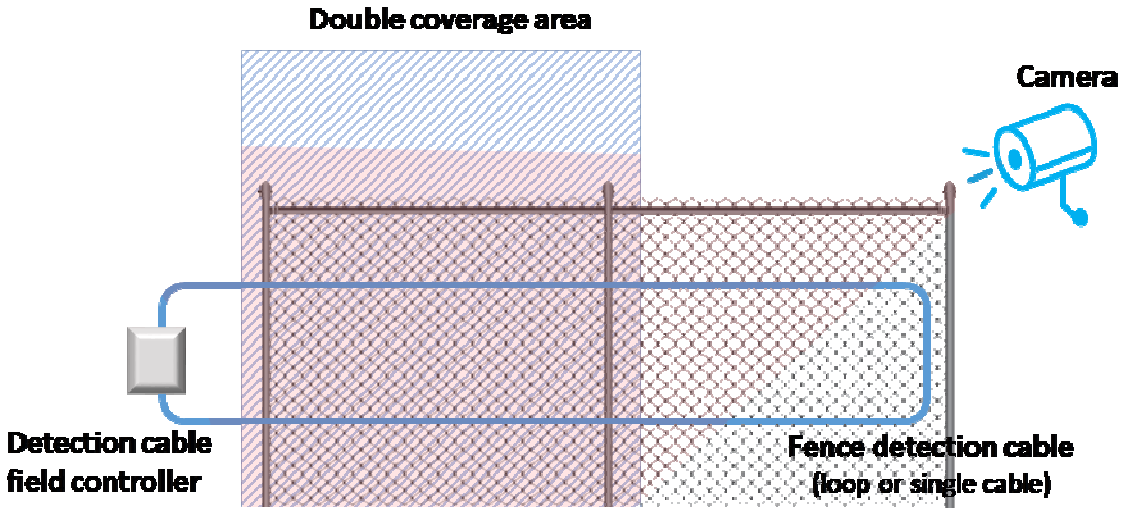

Illustration 16 FDS, video and VCA coverage or urban perimeter

Perimeter Coverage Area

The FDS shall protect all existing wire mesh fences at MIA. The following map illustrates this area. It shall be the responsibility of each bidder to measure and inventory all areas to be covered, including any obstacles, gates, or any other items that affect the FDS.

Illustration 17: FDS coverage area of urban perimeter

Bidders must attend the site survey meeting so that they may gather all of the required information to construct their proposals. This information, along with the Request for Clarification questions and answers and this document constitute all of the data that will be available during the bidding process.

Field Equipment

The contractor shall provide all installation labour, hardware, and electronics for the FDS as described below:

- Sensor cable detection loop. This can be a full loop or a single run of terminated cable;
- Field controllers to connect the sensor detection cable;
- All mounting hardware for the sensor cable, field controllers, and accessories;
- Data and power cables, ducts, and mounting hardware from the field devices to the demarcation points.

Sensor Cable

The sensor cable shall consist of a closed loop or single-run terminated all-weather cable to be fastened to the chain-link fence. No special tools or fasteners shall be required to install the cable and to facilitate maintenance.

Sensor cable shall have a rugged construction to allow bending at gates without use of gate connect kits.

The cable's jacket shall provide full UV protection as well as humidity and salinity protection.

The sensor cable shall be attached at 20-40 cm intervals to the fence mesh with

UV resistant cable ties at a mounting height determined by the manufacturer.

The cable shall be capable of being cut and terminated on site during installation to any length required.

The sensor cable shall be field-repairable with simple hand tools. If damaged, the cable shall be repaired by replacing only the damaged section with a spare sensor cable section and a splice.

The sensor cable shall be capable of providing power to the field controllers without additional cabling.

Field Controllers

Each field controller shall be capable of protecting up to 400 meters of cable with software alarm zones.

Detection processing shall be performed by the various field controllers distributed around the perimeter.

Detection criteria shall reside in non-volatile memory in each controller.

Positioning of the field controllers shall be flexible and determined by such factors as perimeter length, operational convenience, and physical security concerns. Positioning of field controllers shall have no effect on detection zoning and they can be placed anywhere within the 400-meter cable run.

In the event of a temporary loss of communication with the central Controller, each field controller shall have the capability of retaining site data until communication is restored. When communications are restored, the missing data shall be automatically synchronized without the need for any manual operation or reset.

Bidders shall state the amount of available off-line event storage and will estimate, based on typical event and data generation, how long the communications cut-off period can be.

Field controllers will poll the entire length of the sensor cable on a regular basis to check for anomalies or cuts. Any cut or anomaly shall generate an alarm within 30 seconds of the event. Likewise, if the tamper switch is triggered, this will generate an alarm within 5 seconds of the event.

The field controllers shall include appropriate devices or technologies to protect against lightning and electrostatic discharge. Bidders will describe in their offer what technology and measures they intend to implement in detail.

All the system devices shall have the capability to operate over a common voltage input
from 10.5 to 60 VDC.

The system shall utilize a common communication protocol with all sensors and devices to ensure full integration and interoperability.

Each field controller shall operate continuously within specification at temperatures between -20°C and +70°C without assistance from cooling or heating apparatus.

Field controllers shall be hardened to operate within all specifications when continuously exposed to 0 - 100% relative humidity. The field controllers shall be housed in IP66 or equivalent enclosures fitted with locks and tamper switches. The housing shall include hardware to mount it under various conditions, such as poles, horizontal and vertical surfaces such as walls and ceilings, etc. The mounting hardware shall be robust enough to withstand blows or prying, as well as sustained winds of up to 60 m/s. The hardware and housing will be treated so as to inhibit oxidation, surface flaking, and discolouring.

The field controllers shall be capable of accepting contact-closure alarm inputs from auxiliary devices (i.e., microwave, PIR, etc.) and provide alarm interface to the central controller.

The field controllers shall provide up to 150mA at 12 VDC to auxiliary sensors.

Alarm monitoring of the system shall be handled simultaneously in two ways:

- Through a central system controller;
- Through a high-level interface to a compatible third-party Physical Security Information Management (PSIM) or Video Management System (VMS) such as an API or SDK.

System Requirements

The fence-mounted system shall detect vibrations from cut or climb attempts to the fence mesh and subsequently identify the point of intrusion to within 3 meters with a resolution of 1 meter.

The fence sensor shall detect climbing intruders with a weight of 35 kilograms or more with a Probability of Detection (Pd) of 95% at a 99% confidence level. The fence sensor shall detect cuts to the fence mesh with a Probability of Detection (Pd) of 95% at a 99% confidence level.

Each field controller shall monitor up to 400 meters of linear fence with sensor cable using a digital algorithm methodology. The detection algorithm function shall reside in the distributed field controllers and not in a centralized processor or computer.

The length of each zone in the system shall not be restricted to the physical location of the fixed field controllers but shall be variable between 3 meters and the maximum zone length.

The fence sensor shall provide an algorithm on a meter by meter basis which automatically compensates for fence variations making each meter of fence equally sensitive to intrusions. The algorithm uses calibration technique which sets thresholds for each and every cell along the sensor cable. The calibration will be done using the system software and will automatically calibrate every 1 meter of cable.

The fence sensor zone configurations shall be based on the design criteria listed below:

- Zones should not exceed 3 linear meters in length.
- Zones shall not extend around corners in perimeter fencing.
- Zones can be programmed independently in the software without regard for the location of field controllers or sensor cable length.

The fence sensor shall detect single location activity (climbing or cutting the fence) while rejecting other distributed environmental conditions (wind, rain, or other environmental disturbances). The digital signal processing (DSP) shall utilize both temporal and spatial filtering.

The system shall utilize a distributed switching power network that provides DC power to all the modules without the use of separate power supplies. The configuration shall permit the use of a central UPS AC power supply for the entire system.

The system shall allow for DC power input from 10.5 to 60 VDC.

The system shall have a single universal software with a graphical user interface (GUI) to allow setup of all the intrusion sensors from a laptop or desktop computer. The software will provide intuitive setup, guided navigation and forward propagation to simplify setup and calibration in real time.

The software shall support serial or network communications for diagnostics of the Intrusion sensors, both locally or remotely. It shall utilize Auto Discovery to confirm communication of all devices without the need to programme individual addresses.

The software shall provide a real-time GUI that will allow operators to view the system’s status and events, and to manage or activate zones, devices and other settings such as zone by-passes or zone disactivation.

The software shall provide user and operator security features with protected access using authentication methods such as passwords or PINs.

Structured Cabling

The requirements and specifications for the structured cabling portion of the FDS system (eg. networking, control and power cables and hardware) are identical to the ones for the camera system (see Point 7 in this Section).

9. Video Content Analysis System

The VCA system is one of three components of the PIDS. Its function consists in providing a primary or secondary layer of detection to pinpoint attempted intrusions or break-ins along MIA's perimeter fence.

The VCA system can be standalone system or build-in in thermal cameras or cameras.

The VCA system will be used in different ways depending on the area of protection as described in the next section.

MIA's PIDS is divided into three main areas, as follows:

Illustration 1: MIA PIDS areas

The VCA shall be used in three different modalities as described in the next paragraphs.

In the urban perimeter and taxiway areas, MIA's security centre shall use the double knock principle to receive, acknowledge, and process intrusion alarms coming from the PIDS. A primary alarm will be generated by one of

the PIDS system and the operator will then correlate this primary alarm with a simultaneous alarm coming from a secondary PIDS device. The correlation of these two alarms, or double knock, is designed to minimize the number of false alarms and provide redundancy in high risk areas. All of the PIDS detectors are designed to operate 24/7 in lit or unlit environments, and are impervious to rain, winds up to 30 m/s, fog, smoke, and other adverse weather and environmental events.

The correlation of the alarms shall be automated through system integration in MIA's existing Security Centre. The automation shall be done by means of APIs or SDKs supplied and installed by the VCA contractor.

In the urban perimeter area, the primary detection means shall be provided by the FDS (fence detection system), and the secondary shall be triggered by the VCA camera that will cover the same area as the FDS (double coverage), as illustrated:

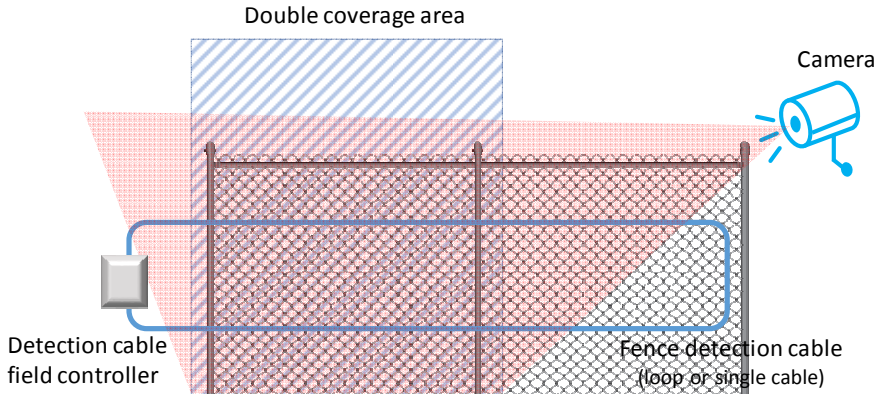

Illustration 1: FDS, video and VCA coverage of urban perimeter

In the taxiway area, both the primary and secondary detection will be provided by VCA cameras. The cameras will be installed in a criss-cross pattern to provide double coverage of the entire perimeter, as illustrated:

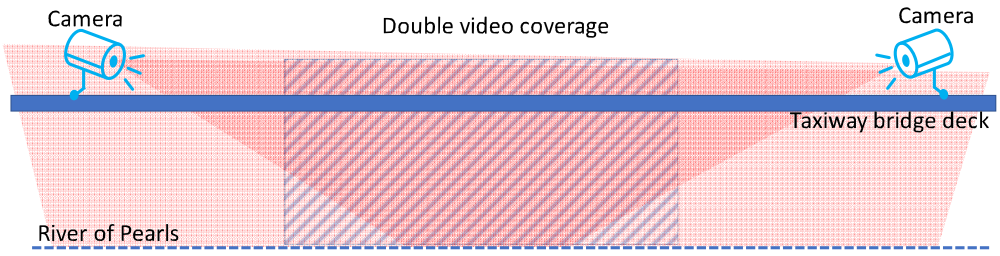

Illustration 2: video and VCA coverage of taxiway perimeter

Finally, in the runway island area, the VCA system will provide single detection (primary only) coverage of the perimeter. This shall be done by means of overlapping cameras that will cover the entire island perimeter, as illustrated:

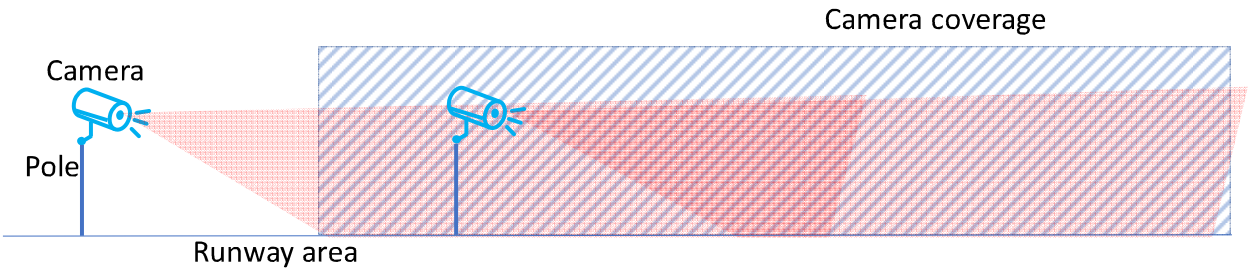

Illustration 3: video and VCA coverage of runway island perimeter

All PIDS camera video feeds shall be provided from the existing VMS which is based on a Pelco VidoeXpert platform.

Technical Specifications

The VCA software shall have an operational mode to be used by security centre operators, and a configuration mode, to be used by system configurators. In either case, access to the software shall be secured by means of user names and passwords.

Actions in the VCA software shall be traced and auditing shall be done by means of tables and reports based on the activity logs that are recorded. These tables, reports, as well as the underlying data shall be easily accessible by MIA personnel. Proprietary formats or extraction tools shall not be acceptable.

All stored data shall be secured and encrypted to ensure optimal protection against external attacks.

System Architecture

If this is a standalone system, the VCA system shall be installed as a fully redundant system with servers located in MIA's main and back-up server rooms.

Camera-based detection algorithms shall not be acceptable as camera-based detection does not have the processing power, nor the memory capacity, required for MIA's outdoor detection applications (see next section for system operation requirements).

The VCA shall be capable of automatically switching from the active server (main) to the other server (back-up) and vice-versa, upon service crash or loss due to a variety of reasons, such as, but not limited to, unstable OS or system power loss. The VCA shall also have the capability of switching from one server to the other upon manual command.

It shall be the responsibility of the contractor to provide the servers and all required software. MIA shall provide designated rack space in its server rooms (main and secondary), power, UPS, ventilation, and data connectivity. MIA shall also provide client stations in the main and secondary security centres, as well as other locations as needed.

System components and transmissions shall be encrypted, secured and authenticated as long as the API connectors support this functionality in order to avoid hacking, eavesdropping, or other cybersecurity issues. Bidders will provide details regarding hardening and defence measures.

VCA Software Operating Principles and Tools

The VCA software shall perform the following functions in real time when analyzing video streams:

- Acquisition of video stream;
- Detection and extraction of moving objects from the video image stream;
- Filtering and classification (salient targets vs outsize targets, intangibles such as shadows, light variations, etc.)
- Triggering of an alarm if detection meets certain criteria (zone, size, trajectory, etc.)

1. Detection Algorithm

Overall, the detection algorithm shall use a multi-layered progressive filtering method as illustrated below:

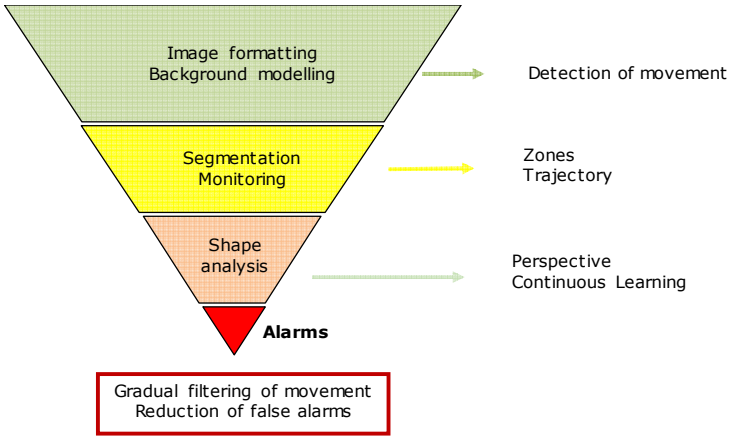

Illustration 4: video and VCA coverage of runway island perimeter

Bidders shall explain, justify, and detail how their chosen algorithm works in their proposal. The algorithm must be designed and optimized specifically for outdoor operation, meaning that unwanted movements stemming from vegetation, background traffic, reflections, or other disturbances will not trigger video alarms. Further, lighting variations due to the natural cycle of the sun, or sudden lighting exposures, such as turning on of lights or headlights, or the sun appearing suddenly after cloud coverage, will also not affect the system.

Bidders will illustrate these points through specific use cases and verifiable references.

Detection performance is based on the following criteria:

- Detection time: within one second, with a maximum of 2 seconds. This does not include additional latency time due to external image acquisition or transmission delays from the network or VMS;
- The object to be detected meets the target criteria;
- Detection rate: > 99% of intrusions based on sufficient target contrast (greater than 5 grey levels on the colour rendering index over each of the 3 channels);
- False alarm rate: a system average of one per day for conventional cameras, one per week for thermal-imaging cameras;
- Minimum object movement for detection: the object must move its centre of gravity by at least 15 pixels in any direction.

Detection Zones

The VCA must support several simultaneous detection zones.
Each zone shall have separate and individual settings based on the criteria listed below.

Detection Criteria

Detection sensitivity must be adjustable by zone. The settings shall offer the option to indicate the type of sensor (colour or thermal-imaging) and sensitivity level.

During calibration, the sensitivity level shall be adjustable in real time without the need for resets or reboots so as to allow configurators to test the effect of specific staged events to trigger alarms.

The VCA shall feature a user-friendly and simple to use sensitivity calibration tool. The preferred tool shall feature a single calibration control for each camera that encompasses all features in the detection algorithm.

Complex interfaces with multiple settings to control the detection algorithm shall not be acceptable unless all of the setting combinations can be recorded as profiles that can be recorded and applied to cameras separately or collectively.

The target detection filter shall allow to set detection criteria based on the inclusion or exclusion of any of the following:

- small targets (typically animals less than human size);
- human-sized targets;
- large targets (typically vehicles larger than human size);
- small and large targets at the same time.

Target Filters

The filter criteria shall be based on the distinction and individual exclusion of any of the following:

- small objects;
- large objects;
- small and large objects at the same time.

The size and type of targets shall be configurable by the configurator.

Perspective Parallax and Learning Tool

The automatic perspective filter shall be used to calculate the relative size of targets in various position along the parallax of the field of view (FOV). The parallax refers to the visual effect of an object of the same size being perceived as smaller or larger based on its proximity or distance away from the camera's position and FOV, as illustrated below:

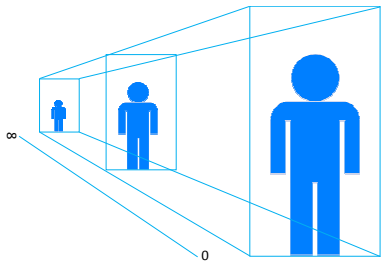

Illustration 4: Parallax Effect

The filter shall be configurable and will treat a target of the same physical size as a single object no matter where they are in the FOV relative to the parallax. A target progressing in any direction along the parallax shall be treated consistently as a single object and shall not trigger multiple alarms.

Perspective shall be configurable so as to filter out objects which do not meet the size detection criteria. The perspective function shall work on the assumption that objects move along the ground and that the ground is relatively flat.

The perspective function shall include a learning function to calibrate the detection criteria. When the learning function is activated, it will analyze recorded video to be selected by the configurator who will then identify false and real positives. Based on these reference values, the VCA software will cycle through recorded video to refine its search and targeting criteria to improve and enhance its detection capabilities.

Configurators shall be able to select any number of video files of their choice to do the base calibration or subsequent learning process.

Alarm Event Processing

Once a target has been identified by the VCA, an alarm event shall be generated.

The VCA system shall then automatically transmit two simultaneous messages to any or all of the following recipients:

- Video alarm with event information text and video clip of the event to the VCA authorized client station(s);
- Separate video alarm event information text and video clip of the event to a third-party software via an API;
- Separate video alarm event information text and video clip of the event to a third-party ftp server or database.

For each event, the operator shall receive a video clip featuring a recording of pre- and post-event action. Configurators shall be able to set the pre- and post-even video clip duration, as well as the outline presence.

The video clip shall display a red or high contrast colour outline around the target that triggered the event. This outline shall follow the identified target throughout the duration of the video clip. The preferred contour shall

feature a dynamic outline that matches the target's shape. Box outlines shall also be acceptable, as illustrated below. Split or disappearing outlines shall not be acceptable.

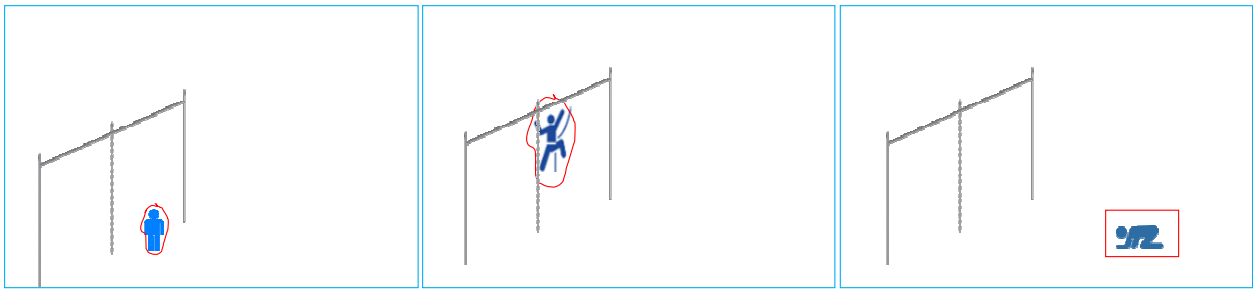

Illustration 5: Examples of target outline identification (indicative)

The event processing sequence is designed to provide simultaneously to the operators the information they need to quickly identify and verify the nature of an alarm. MIA shall use the following alarm operating procedure for alarm handling:

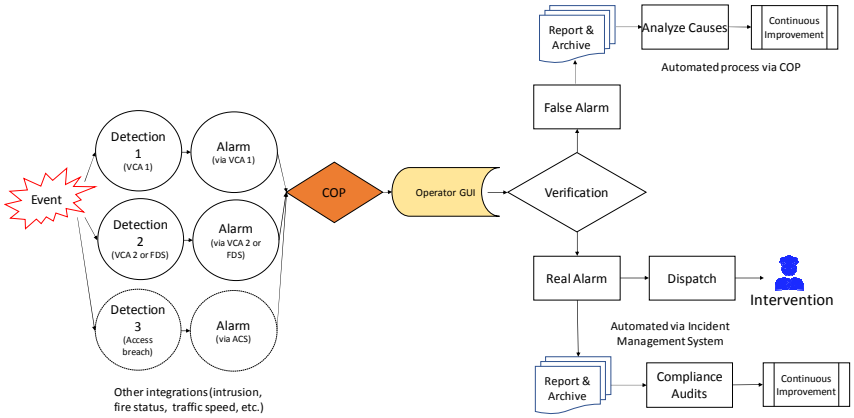

Illustration 6: Alarm event handing process

The outline function shall be used during the verification process.

The VCA shall be capable of recording all events in separate text and video files. These recordings will be done separately from the VMS, ensuring that, as a minimum, all alarm events are stored. Bidders will recommend the storage capacity based on best practices and their experience. MIA sets a minimum of 180 days' storage for alarm videos and related event data comprised of a 5-minute video recording (2 minutes pre-alarm and 3 minutes post-alarm). Minimal frame rate will be 5 fps. Bidders should calculate capacity based on the number and types of cameras outlined in the camera quantities section.

These files shall feed the reporting and continuous improvement processes (upper process branch).

Operators shall be able to send video clips to external recipients, such as police or law enforcement officers, to assist them in their intervention of subsequent investigation (lower process branch).

Client Station Software

The VCA system shall feature a separate client station software.

Access to the software by operators shall be controlled by user names and passwords. Bidders will provide details regarding this functionality and compatibility with existing solutions.

The client software shall provide the following functionality:

- Simple and user-friendly interface;
- Configurable matrix-style camera interface;
- Access to connected cameras in live and recorded mode;
- Automatic alarm event display based on the criteria listed previously;
- Search capabilities (date/time and location).

The main purpose of the VCA client is not to replace the VMS, but to display incoming alarm events and to search for specific video clips and past events. It can also be used as a back-up interface in case the future integrated 3rd party interface fails.

Specifications Table

The VCA shall meet the following minimum criteria:

Data	Values
Minimum surface area of the objects to be identified in the analysed image	250 pixels of surface for conventional cameras (eg, 25x10 px for a person) 100 pixels of surface for thermal-imaging cameras (eg, 16x6 px for a person)
Resolution of analysed images	320x240 pixels
Analysis frame rate	5 images/second
Detection time (standard settings)	< 2s

Detection rate	> 99%
Minimum movement of target to be detected	15 pixels
False alarm rate	1 per day for conventional cameras 1 per week for thermal-imaging cameras
Maximum camera vibration	1 pixel shift between images
Minimum detection distance	Based on configuration mapping software
Maximum detection distance	Based on configuration mapping software
Maximum camera height	No limit
Indoor/outdoor use	Indoor/outdoor
Supported video feeds	OnVIF compliant H.264
Number of cameras analysed simultaneously (by server meeting minimum requirements)	16 using CIF acquisition at 5 img/s

Camera Quantities

Based on the deployment of the PIDS camera system, the VCA system shall be connected to the following quantities of cameras. Bidders will quote based on these quantities and shall provide pricing for additional individual camera licences.

Thermal Cameras	Day/Night Cameras	Totals
66	20	86

Thermal cameras shall have a resolution of 320 x 180 pixels

Design and Configuration Mapping Software

The VCA shall have a configuration and design mapping software that will allow operators to import external map files in various formats.

The tool shall allow operators to place and configure cameras within the map environment and will automatically calculate the following parameters:

- Camera height;

- Camera tilt angle;
- Camera orientation;
- Calculated blind zones under the camera;
- Camera effective detection range;
- Simulated illustration of the field of view.

The map shall automatically display the effective detection range on the map which will indicate which areas will be covered

The tool shall have a library of existing cameras available on the market to facilitate data input. It shall also allow for the creation of custom cameras with the following criteria:

- Sensor type;
- Manufacturer;
- Model;
- Sensor resolution;
- Focal length of the lens.

The tool shall produce automatic reports listing the following information:

- Map of entire area;
- Position of each camera and projected effective detection range;
- Individual information for each camera listing all of the items listed above.

The report shall be used to provide detailed installation information for the camera installers. It shall also be used to verify the as-is installation during the camera acceptance tests.

The tool shall guarantee that the VCA detection software shall work properly within the calculated effective detection ranges.

Camera and Light Requirements

The VCA system's main feeds shall come from thermal imaging cameras, so no lighting shall be required.

Optionally, the VCA system shall use conventional day/night camera or infrared-lit feeds, in which case it shall be important to control lighting in the following manner:

Camera Type	Illumination
Thermal Imaging	No lighting required
Day/Night Colour Camera	Visible lighting required, see illustration 5
Infrared camera	Infrared illumination required, see illustration 6

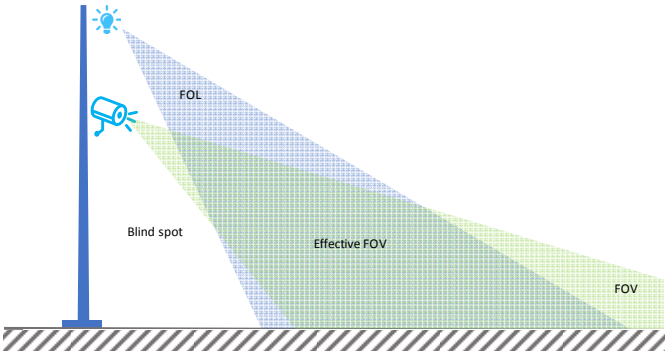

Illustration 5: Visible illumination installation

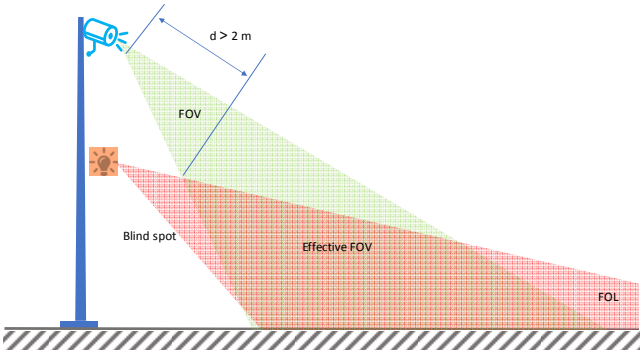

Illustration 6: Infrared illumination installation

10. Documentation Requirement

10.1 The Contactor shall provide fully detailed sets of Operating and Maintenance Manuals in English for the whole system including each item of equipment. The program of maintenance proposed by this Contractor shall be fully detailed and all maintenance program offered by this Contractor shall be fully described. The method for obtaining spare parts for the complete system shall be fully described.

10.2 Supply at least five (5) sets of relevant handbooks, system operation manuals, software developer kits (SDK) and application programming interface (API) documentations in English and Chinese version as applicable.

10.3 All the detailed cabling records, drawings shall be provided in hardcopy and softcopy (in CAD format).

11. PIDS Camera, FDS and VCA System UATs and Commissioning

11.1 Contractors shall be responsible for configuring the systems as described. Once this is done, MIA shall proceed with UATs (User Acceptance Tests) to be followed by a trial period that will last at least two calendar weeks.

11.2 The UAT period will start once the on-site operator training (see next section) has been delivered to all concerned operators. During the UATs, MIA security operators shall use and test the system with an on-site system technician. This will allow for the final configuration and initial testing of the system. The UAT shall take at least three full days using real cameras and sensors, and simulated and real events. The UATs will be completed with a sign-off document.

11.3 Once the UAT has been signed off, the camera system trial period shall begin, lasting a minimum of two full working weeks. During this period, MIA security operators shall use the system without any assistance from the contractor. MIA operators will record and log all system incidents and issues.

11.4 Once the trial is completed, MIA and the contractor shall formally commission and receive the system. The commissioning tests shall be based on a formal check list to be completed on site for

1-2 days. The check list will include the logs from the trial period and any corrective actions deemed necessary during the UAT and trial periods.

12. Support Requirements

12.1 Defect Liability Period of 2 years from provisional acceptance for all software and hardware defects. Contractor shall correct these defects free of charge to the Employer during the warranty period.

12.2 To overhaul the entire installation once a year and make good or rectify any defective item and to submit a completion certification to the Employer.

12.3 To supply all spare parts and other necessary materials, tools, and instruments.

12.4 Hardware and software warranty shall be effective from the day of installation or delivery to the site and valid throughout the Defects Liability Period until Final Acceptance.

13. User Training and Skill Transfer

13.1 Defect Liability Period of 2 years from provisional acceptance for all software and hardware defects. Contractor shall correct these defects free of charge to the Employer during the warranty period

13.2 Contractor shall provide all relevant training courses for the camera system and management tools and collocation operation.

13.3 All costs relevant to training courses, materials and instructors shall be the contractor’s responsibility.

13.4 The Bidder must submit a training plan showing the training programs that will be provided. The training plan should include the training outline for each course.