Technical Specification

Transport and Main Roads Specifications
MRTS225 Imaging

March 2020

Queensland Government

Copyright

Licence

CC BY licence summary statement

Translating and interpreting assistance

The Queensland Government is committed to providing accessible services to Queenslanders from all cultural and linguistic backgrounds. If you have difficulty understanding this publication and need a translator, please call the Translating and Interpreting Service (TIS National) on 13 14 50 and ask them to telephone the Queensland Department of Transport and Main Roads on 13 74 68.

Disclaimer

While every care has been taken in preparing this publication, the State of Queensland accepts no responsibility for decisions or actions taken as a result of any data, information, statement or advice, expressed or implied, contained within. To the best of our knowledge, the content was correct at the time of publishing.

Feedback

Please send your feedback regarding this document to: tmr.techdocs@tmr.qld.gov.au

Contents

1 Introduction

This Technical Specification defines the design, supply, installation, testing and commissioning, performance, documentation, training and maintenance requirements of imaging infrastructure/services for ITS network applications. Provision of Automatic Number Plate Recognition System (ANPR) is not within the scope of this Technical Specification. Refer to MRTS250 *Provision of Automatic Number Plate Recognition System* for ANPR requirements definition.

The scope of this Technical Specification includes the following:

a) supply and/or installation of imaging equipment, including IP-based PTZ CCTV and IP Camera

b) supply and/or installation of supporting infrastructure, including field cabinets, conduits, mounting poles and the like

c) integration of new CCTV capacity with exiting systems infrastructure

d) Contractor shall act as the Principal's agent with the local electricity supply authority, including arranging connection of supply as described in MRTS210 *Provision of Mains Power*

e) provision of permanent and temporary telecommunications services necessary, and

f) all design, documentation, supply, installation, disconnection, removal, relocation, connection, testing and commissioning of the above mentioned works.

This Technical Specification shall be read in conjunction with MRTS01 *Introduction to Technical Specifications,* MRTS200 *General Requirements for ITS Infrastructure*, MRTS50 *Specific Quality System Requirements* and other Technical Specifications as appropriate.

This Technical Specification forms part of the Transport and Main Roads Specifications Manual.

Where Technical Specifications are quoted or implied, the latest version shall be applicable, including its amendments to date.

All CCTV infrastructure shall be in accordance with the Queensland Government Information Security Standard 18 (IS18).

Where there is any doubt in regards to which party undertakes any work under this Technical Specification, the Contractor shall undertake the work in consultation with the Transport and Main Roads Project Representative.

The term 'project' used throughout this document shall refer to the provision of any CCTV infrastructure and not be restricted by value.

This Technical Specification covers new CCTV infrastructure only and shall not to be applied retrospectively to existing infrastructure. Any existing infrastructure requiring to be replaced due to obsoleteness of legacy equipment and other maintenance considerations and any end of life factors or incompatibility with Transport and Main Roads' current video management system, FLIR Latitude, shall be carried out in accordance with the respective district ITS maintenance program.

The terms defined in MRTS201 *General Equipment Requirements* apply to this Technical Specification. Additional terminology relevant under this Technical Specification are defined in Table 2 below.

2 Definition of terms

For the purpose of this Technical Specification, in addition to those defined in Clause 2 of MRTS01 *Introduction to Technical Specifications*, the definitions in Table 2 below apply.

Table 2 – Definitions

Term	Definition
ADSL	Asynchronous Digital Subscriber Line
AGC	Automatic Gain Control
CAT	Customer Acceptance Tests
CAT5/5E	Category 5 Ethernet copper cabling
CCD	Charge Coupled Device/Photo sensor
CCTV	Closed Circuit Television
CIF	Common Intermediate Format
CMS	Changeable Message Sign
Codec	Device or computer program capable of encoding or decoding a digital data stream or signal
COTS	Commercially Off the Shelf
CPTED	Crime Prevention Through Environmental Design
CT	Commissioning Tests
District ITS Administrator	An authorised Public Service Officer who is responsible for the administration of respective District ITS infrastructure.
DNS	Domain Naming System
E&T	Engineering and Technology Branch
EFLI	Earth Fault Loop Impedance
Electrical Legislation	*Electricity Act* 1994 and associated amendments and Regulations and *Electrical Safety Act* 2002 and associated amendments, Regulations and Codes of Practice.
ELV	Extra Low Voltage
FLIR	Principal's video management system
FOBOT	Fibre Optic Break Out Terminal
FTP	File Transfer Protocol
GPO	General Purpose Outlet
GUI	Graphical User Interface
GWIP	Government Wideband IP
HMI	Human Machine Interface
HSDPA	High-Speed Downlink Packet Access
HSUPA	High-Speed Uplink Packet Access
HTTP	Hyper Text Transfer Protocol
HTTPS	Hyper Text Transfer Protocol Secure
I/O	PLC Inputs/Outputs

Term	Definition
IAT	Installation Acceptance Tests
Image Quality	Parameters of image information, such as resolution, colour, contrast and image refresh rate.
Imaging equipment	Lens, camera, housing, Pan-Tilt unit, mounts, pole, field cabinet, transmitters, receivers, associated cabling and any other equipment and works necessary to operate as intended.
IRE	An IRE is a unit of measurement used to represent the value of composite video signal on a normalised scale.
kbps	Kilo Bits Per Second
LCS	Lane Control Sign
Local electricity supply authority	Interchangeable between local authorities responsible for electricity distribution network and/or retail sale of electricity.
LSZH	Low Smoke Zero Halogen
MAC	Media Access Control
MCB	Miniature Circuit Breaker
MP	Mega Pixel
NATA	National Association of Testing Authorities
NTP	Network Time Protocol
Pixels per metre	Unit is used to measure resolution of pixel camera and calculated by dividing horizontal number of pixels in the sensor by Horizontal Field of View of the camera at the scene in metres.
PLC	Programmable Logic Controller
PoE	Power over Ethernet (IEEE802.3af)
PoE+	Power over Ethernet (IEEE802.3at)
POS	Point of Supply
PSSEM	Public Safety, Security and Emergency Management (Program)
PTZ	Pan-Tilt-Zoom
QGCIO	Queensland Government Chief Information Office
RAID	Redundant Array of Independent Disks
RCD	Residual Current Device
RPEQ	Registered Professional Engineer of Queensland
SCADA	Supervisory Control and Data Acquisition
SFTP	Secure File Transfer Protocol
SNR	Signal To Noise Ratio
SSH	Secure Shell
The Principal's TMC	Transport and Main Roads (TMR) State of Queensland Traffic Management Centres.
TMC	Traffic Management Centre
TMR Project Representative	A responsible and authorised Public Service Officer representing Transport and Main Roads on a given project.

Term	Definition
Type Approved	Devices that are type approved have undergone internal evaluation and can be used by projects and their Contractors on Transport and Main Roads infrastructure. Existing approvals subject to review at any time.
UPS	Uninterruptable Power Supply
VLAN	Virtual Local Area Network
VMS	Variable Message Sign
VOIP	Voice Over IP Technology
VSL	Variable Speed Limit

3 Reference documents

The requirements of the referenced documents listed in Table 3 of MRTS201 *General Equipment Requirements* and Table 3 below apply to this Technical Specification. Where there are inconsistencies between this Technical Specification and the referenced MRTS documents, the requirements specified in this Technical Specification shall take precedence.

Table 3 – References

Document	Description
AS 4806	*Closed Circuit Television (CCTV)*
AS 60529	*Degrees of protection*
AS 61508	*Functional safety of electrical/electronic/programmable electronic safety-related systems*
AS/NZS 1768	*Lightning Protection*
AS/NZS 3000	*Electrical installations (known as the Australian/New Zealand Wiring Rules)*
AS/NZS 3015	*Electrical installations – Extra-low voltage DC power supplies and service earthing within public telecommunications networks.*
AS/NZS 3085.1	*Telecommunications installations - Administration of communications cabling systems - Basic requirements*
AS/NZS 3100	*Approval and test specification*
AS/NZS ISO 9001	*Quality Management Systems – Requirements*
IS18	QGCIO Information Security Standard
MRTS01	*Introduction to Technical Specifications*
MRTS50	*Specific Quality System Requirements*
MRTS61	*Mounting Structures for ITS Devices*
MRTS91	*Conduits and Pits*
MRTS97	*Mounting Structures for Roadside Equipment*
MRTS200	*General Requirements for Intelligent Transport Systems Infrastructure*
MRTS201	*General Equipment Requirements*
MRTS210	*Provision of Mains Power*
MRTS226	*Telecommunications Field Cabinets*
MRTS228	*Electrical Switchboards*

Document	Description
MRTS234	*Communications Cables*
MRTS245	*ITS Telecommunications Network (ITS TN)*
MRTS250	*Provision of Automatic Number Plate Recognition System*
MRTS263	*Standalone Solar (PV) Power Systems*
RPDM	*Road Planning and Design Manual*
Translink Busway Position Paper	*Vision Management through Needs Analysis Technology & Camera Placement*
TRUM	*Traffic and Road Use Management* Manual

4 Quality system requirements

The quality system requirements defined in MRTS201 *General Equipment Requirements* apply to this Technical Specification.

4.1 Hold Points, Witness Points and Milestones

The Hold Points applicable for this Technical Specification are summarised in Table 4 below. There are no Witness Points and Milestones defined.

Table 4 – Hold Points, Witness Points and Milestones

Clause	Hold Point	Witness Point	Milestone
5.1	1. Functional Design to be developed and provided to the Transport and Main Roads Project Representative for review and approval 14 days prior to any Detailed Design being undertaken by the Contractor.		
7.4	2. Additional CCTV infrastructure is network enabled by the department's nominated ITS Network Management Party.		
12.0	3. Systems integration undertaken (if applicable as determined by the department's Project Representative).		
13.1	4. IAT, CT and CAT plans to be submitted to the department's Project Representative 28 days prior to any testing commencing.		
13.4	5. All FLIR licences shall be provided for system and configuration completion.		
13.5	6. Equipment certified and in compliance of all respective components.		

Clause	Hold Point	Witness Point	Milestone
13.6	7. Equipment commissioned and in compliance of all respective components.		
13.7	8. Customer acceptance following end-to-end deployment.		
14.0 – 17.0	9. Handover of all requested project documentation, software, agreed maintenance spares and any other deliverables agreed as part of project delivery.		

Quality system requirements for this Contract shall be in accordance with this Technical Specification, MRTS01 *Introduction to Technical Specifications* and MRTS50 *Specific Quality System Requirements*.

The Principal reserves the right to evaluate and, where necessary, request improvement to the Contractor's quality system throughout the Contract. Arrangements for conducting evaluations shall be mutually agreed and confirmed in writing.

In Contracts where a Contractor becomes the major supplier, the Contractor shall meet the requirements of AS/NZS ISO 9001 and this Technical Specification.

4.2 Sample for acceptance

The requirements defined in MRTS201 *General Equipment Requirements* apply to this Technical Specification.

5 Functional requirements

5.1 Functional design

An ITS functional design shall be undertaken to set the requirements on which the detailed design is based. The ITS functional design for any new CCTV capacity shall incorporate the following minimum system requirements:

a) enable the seamless integration with the Principal's existing departmental video system (currently based on FLIR Latitude. The Contractor shall confirm the version applicable to the given project with the department's Project Representative – for example, v6.3)

b) be monitored by the Principals TMC

c) be fit for purpose

d) be commercially off the shelf (COTS) – i.e., not based on proprietary standard

e) be value for money

f) requires minimal maintenance

g) support security requirements in accordance to Industry and Principal's specific security standards/policies

h) be designed in a way which allows for high availability (applicable only for safety critical functions)

i) incorporate CPTED principles in the design

j) use equipment which is physically and technologically robust and reliable, and

k) be based on a common reusable pattern.

PTZ Analog cameras shall not be used for new departmental infrastructure.

The overall ITS functional design (which covers more components than CCTV) shall be submitted to the department's Project Representative for review and approval at least 14 working days prior to any detailed design being undertaken. **Hold Point 1**

5.2 PTZ IP cameras

As part of the development of an ITS Functional Design by the Contractor in consultation with the Transport and Main Roads Project Representative at the project concept phase, fully integrated IP network enabled Pan Tilt Zoom (PTZ) cameras be considered as an option as part of the overall CCTV system for Transport and Main Roads' Traffic Management System.

This type of camera shall provide high resolution video feeds/images to the Principal's traffic management operators to provide the functional outcomes as follows:

a) detect, verify and manage incidents and other traffic conditions

b) verify the display of each dynamic message sign (for example, VMS, CMS, VSL, LCS, VSL/LCS, ramp signalling system and other departmental display devices)

c) monitor and control the imaging equipment from the Principal's Traffic Management Centre (TMC) and/or other nominated location(s)

d) monitor pedestrian, cycleway, transit activities and each help phone/point

e) monitor departmental infrastructure (including, but not limited to, tunnels, egresses, cabinets, switch/node/electrical/communications rooms)

f) monitor operation of the Principal's Heavy Vehicle Management System, including security at the associated interception sites, and

g) any other project-specific requirements defined by the ITS functional design.

Images shall be transmitted to the Principal's TMC and other sites as specified in the Contract.

The project ITS functional design shall specify the locations and type of PTZ IP cameras. PTZ IP cameras positioned in the vicinity of commuters on busway stations, park and ride facilities and tunnels shall be of the fully integrated and enclosed dome type.

Where required by the ITS functional design, and as applicable to busway infrastructure, cameras shall be mega pixel type with sufficient pixels to determine features of the target in accordance with the Translink position paper regarding Vision Management through Needs Analysis, Technology & Camera Placement, with respect to the functions of observe, detect and/or identify.

PTZ IP cameras positioned in parallel to a roadway shall use either:

a) a fully integrated dome type where the PTZ mechanism is fully integrated into the dome, or

b) the dedicated PTZ mechanical unit type which includes a standalone or integrated Fixed IP camera within.

However, the ITS functional design will determine the most suitable type of camera type to be selected for sites situated parallel to a road.

IP or Network Enabled PTZ cameras are generally utilised for incident and general surveillance purposes within the department. PTZ cameras help enable TMC and other authorised traffic operations sites to effectively manage incidents that occur from time-to-time on the respective road transport corridors. A benefit is that technical operation status of these cameras can be more readily accessed, allowing for ease of administration and maintenance, in contrast to their Analog counterparts. Some low powered cameras can also be powered over the same Ethernet cable used for the video signal.

5.3 Fixed IP cameras

As part of the development of an ITS functional design by the Contractor in consultation with the Transport and Main Roads Project Representative at the project concept phase, fixed IP cameras shall be considered where there is a requirement to display an overview of the traffic and weather conditions of strategic points along the road network or at other project specific locations where a static video image is required as approved by the department's Project Representative.

Fixed Analog cameras shall not be used for new departmental infrastructure.

The images shall meet privacy requirements as covered by the 11 Information Privacy Principles (IPPs).

This type of camera may be used, but not limited, to the following functions or purposes:

a) Traffic information display on the 131940 website with the link to the departmental website. These images provide visual information on the general characteristics of the traffic flow to the public.

b) Automatic incident detection (if required as part of the specific project ITS functional design requirements).

c) Traffic or pedestrian statistics (if required as part of the specific project ITS functional design requirements.

d) Project time lapse functions (if required by the specific Transport and Main Roads Project Representative), and

Some significant projects in the past have required the construction phases to be captured in a time lapse format for the purposes of reviewing site work phases while also providing a video record of the project completion and the resultant local traffic flows. In these cases, temporary CCTV system components are installed and configured by the project. Images are generally captured via existing departmental ITS infrastructure (if this exists in the close proximity of the project) or captured locally by the project via digital video recording or FLIR Media Archiver capacity.

e) Other project-specific requirements – e.g., flood monitoring, public sign display (VSL/LC or VMS image display through the 131940 website), road works.

Images shall be transmitted to the relevant data collection server for 131940 website upload, Principal's TMC and other sites as specified in the Contract.

Fixed IP cameras or network-enabled cameras are widely utilised in the surveillance industry and the benefit of using this type of camera is that they can be readily connected to existing computer networks and also they can be powered using the same cable which provides for control and video signal via Power Over Ethernet (PoE) Technology. They also have the added benefit of having the encoder technology embedded in the camera rather than having this completely powered and physically separate, which was the case for all Analog-based CCTV systems in the past.

5.4 Mega pixel capable IP cameras

As part of the development of an ITS functional design by the Contractor in consultation with the Transport and Main Roads Project Representative at the project concept phase, mega pixel capability shall be considered to provide high resolution images capable of determining the identification of persons.

At a minimum, mega pixel capable cameras shall support H.264 compression and be a minimum of 3 MP resolution.

Where applicable for busway infrastructure, mega pixel capable cameras may be used for coverage of station entrances/exits, stairways and lifts or in other station circulation areas where permitted by the Transport and Main Roads Project Representative. This will occur only where PTZ functionality does not meet the coverage objectives of the Busway Operations Centre (BOC). Mega pixel-based camera deployment shall align with the criteria set out in the Translink position paper Vision Management through Needs Analysis, Technology & Camera Placement, Appendix B, Table B2.

6 Performance requirements

6.1 General

Images shall be captured, transmitted and displayed at the highest quality and refresh rate permitted by the capacity of the imaging equipment and the network transport medium.

Video and control signals associated with a particular camera must be transmitted digitally over the same telecommunications channel. Where possible, proprietary compression codecs should not be used. Unless otherwise specified in the Contract, any video feeds/images shall be transmitted to the Principal's TMC.

The images should be focused (including back focussed as appropriate) and clear to the operator.

Imaging equipment and images shall be fully compatible and interoperable with the imaging display and control systems being utilised by the Transport and Main Roads, current at the time of the provision of the equipment.

As on the date of this document, the imaging display and control system of the department is FLIR Latitude. The Contractor shall confirm the version of FLIR in use at the time by contacting the department's Project Representative.

All CCTV Edge device hardware, such as cameras and encoders (for the replacement of existing Analog CCTV where approved by the Transport and Main Roads Project Representative), shall be compatible with the department's current imaging and control system, FLIR Latitude. For new sites, the use of a separate encoders for Analog cameras will not be accepted.

Information on the current devices that are compatible with FLIR can be found via: https://www.flir.com.au/support/products/latitude#Resources or www.flir.com.au.

Imaging equipment shall utilise proven industry standards that are current at the time of the provision of the equipment.

Video images shall be transmitted either in real-time or frame rate throttled as determined by the communication system used at each camera site, the ITS functional design and IP network capacity or bandwidth constraints. Subject to capacity constraints, end-to-end image compression/decompression shall retain the maximum image quality to ensure that the ITS functional requirements are met.

6.2 Image data rate

Where images are transmitted from the field cabinet to the TMC entirely by optical fibre networks, the transmitted image shall be refreshed with at least 25 frames per second (FPS) at maximum camera resolution over the full dynamic ranges of the camera.

Unless otherwise specified by the department's Project Representative, and in accordance with the ITS functional design for busway infrastructure, the images shall also be transmitted with a refresh rate of 25 FPS.

Where the image is to be transmitted other than entirely by optical fibre networks, the transmitted image shall be refreshed with at least four frames per second at SVGA 800 x 600 pixel resolution over the full dynamic ranges of the camera.

However, a network bandwidth calculation shall be undertaken to ensure that the image data rate can be accommodated by an approved departmental communications service, such as ADSL2+, 3G HSDPA/HSUPA, 4G, GWIP or other unlicensed proprietary privately established wireless links.

Upon resumption of normal (primary) transmission channel bandwidth, the image quality shall automatically return to normal image quality and the maximum possible frame rate.

6.3 PTZ CCTV applications

6.3.1 Type 'P' (Pedestrian) applications

At all points in the area(s) nominated in the Contract, the entire body of a person approximately 1.8 m tall must occupy at least 240 vertical pixels of the uncompressed image captured by the camera.

Human characteristics, such as hair, skin and clothing colour (during daylight hours), and bodily appearance, sufficient to make positive identification, shall be made available to the Principal's TMC operator at locations nominated in the Contract in all lighting conditions.

The decompressed image at the Principal's TMC must display the same person with at least 240 vertical pixels when shown at 100% of image size.

6.3.2 Type 'V' (Vehicle) applications

At all points between CCTV camera installation sites, an entire small passenger sedan vehicle must occupy at least 25 vertical pixels (approximately 60 mm per vertical pixel) of the uncompressed image captured by the camera.

Vehicle characteristics, such as colour (during daylight hours) and shape, must be easily discernible at all points between CCTV camera installation sites in all lighting conditions.

The decompressed image at the Principal's TMC must display the same vehicle with at least 25 vertical pixels when shown at 100% of image size.

6.3.3 Type 'B' (Busway) applications

In addition to the Type P and V applications above, for functional requirements on busway infrastructure for PTZ CCTV applications, refer to the referenced Translink Busway Position Paper for Vision Management through Needs Analysis, Technology & Camera Placement, with particular reference to Appendix A.2, B.1 and B.2.

6.4 CCTV control system

The latency of commands issued by the operator in the Principal's TMC to any of the following components should be less than 200 msec.

a) FLIR Latitude ControlCentre Client Software

b) FLIR Latitude AdminCentre Client Software

c) FLIR Media Archiver

d) FLIR Web Client, and

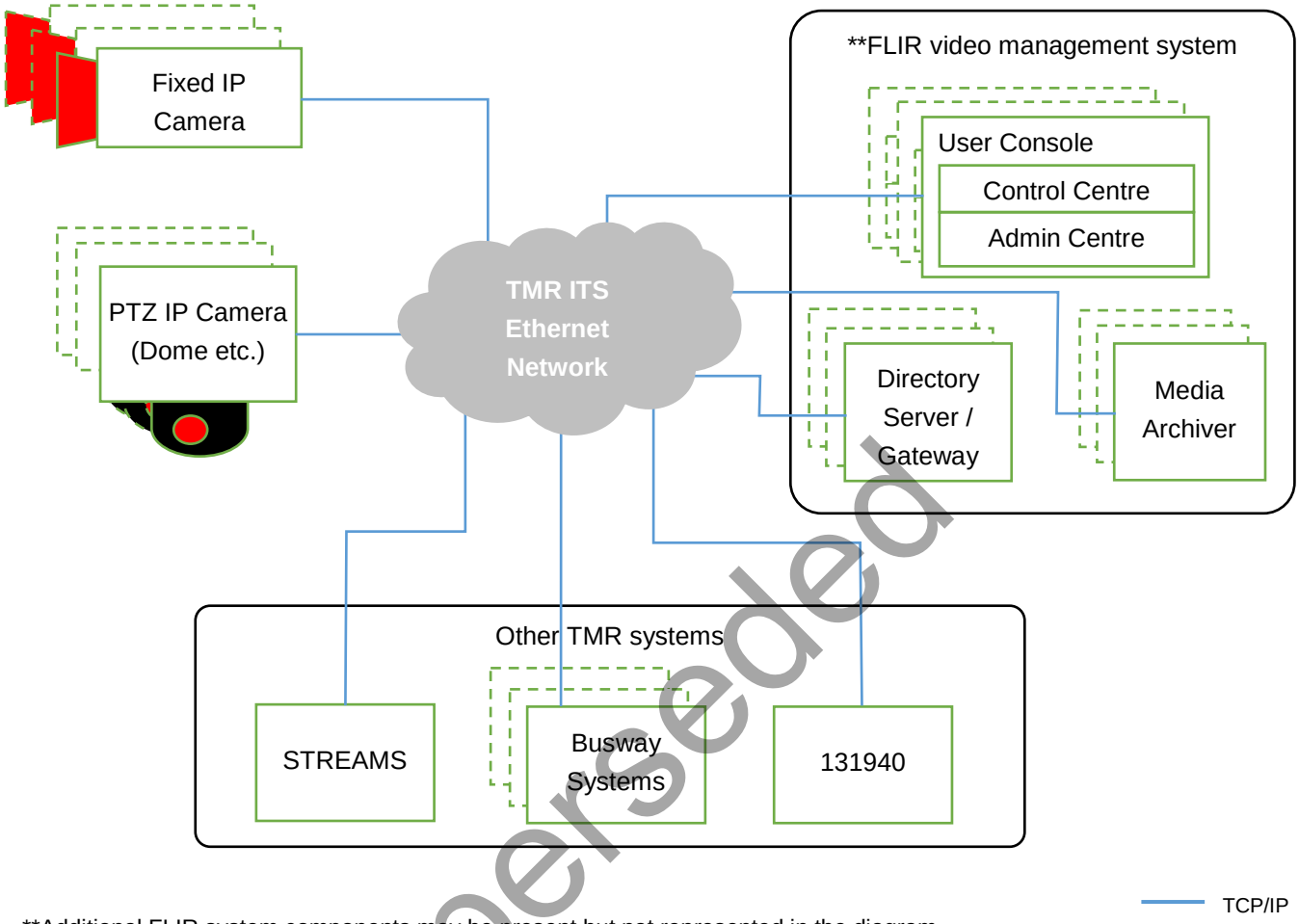
e) FLIR Directory Server.

7 Design requirements

7.1 General CCTV system architecture

The general CCTV system architecture with functional camera other connection options is shown below:

Figure 7.1 – High Level Video System Architecture



**Additional FLIR system components may be present but not represented in the diagram

7.2 General requirements

Based on the ITS functional design, the following shall be provided by the Contractor and submitted to the department's Project Representative for review:

a) calculations for telecommunications bandwidth requirements

b) drawings illustrating each camera's fields of view, and

c) statement of design co-ordination with landscaping, CPTED and sign design.

7.3 Location selection

The location of cameras shall comply with the following requirements:

a) Camera locations shall consider occlusion from vegetation (when fully grown) and other objects, such as signs and structures. Wherever practicable, cameras shall be located on the outer curve of roadways.

b) An ITS functional design shall detail the proposed location of all cameras that are PTZ capable. The locations shall be accepted by the department's Project Representatives.

c) The GPS location of each camera is to be recorded.

d) Any cameras located in areas where private residences may be viewable by PTZ IP cameras, those cameras shall have privacy settings configured, and

e) For busway and other infrastructure as approved by the department's Project Representative, refer to Table 7.3 below (sourced from the Translink Busway Position Paper regarding Vision Management through Needs Analysis Technology & Camera Placement) when considering the locations of CCTV in these areas.

Table 7.3 – CCTV operational areas

Area of operation		**Busway PSSEM Priority 1 (Data Storage – 7d)**	**Busway PSSEM Priority 2 (Data Storage – 15d)**	**Busway PSSEM Priority 3 (Data Storage – 30d)**
Public access areas	Public entry/exit at strategic points. For example, access pathways/steps to platforms.			Identify
Help points		Identify/observe		
Car parks	Entry/exit points (Vehicles)		Observe	

7.4 Networking and security

All additional CCTV system capacity shall be seamlessly integrated into the existing ITS network and comply with the requirements of MRTS245 and not limited to the following requirements:

a) A detailed network design (including IP addresses, subnet masks, default gateway, VLANs, etc.) shall be undertaken giving consideration to the existing ITS network design/constraints. This is to be provided to the department's Project Representative for assessment.

b) At a minimum, all CCTV devices shall communicate over 10Base-T/100Base (RJ-45) Ethernet. Where the 90 m cabling limit of Ethernet is exceeded, the transmission medium shall be single mode optic fibre. Copper Ethernet/PoE extenders shall not be used.

c) Networking security shall be enabled on all CCTV devices in accordance with the Information Security Standard 18 (IS18).

d) All network-enabled equipment (including cameras) shall have user access authentication functionality such that a username and password is required to be entered into the device for operational, maintenance and administration purposes.

e) All factory default usernames and passwords shall be changed once connected to the ITS network.

The FLIR Latitude system enables any approved video to be extracted in an encrypted format. The software architecture also utilises proprietary communications between the server and client software components.

f) System administrator passwords on systems must, where technically possible, comply with the security requirements of IS18.

g) MAC address of devices shall not be software configurable.

h) Supports SFTP and HTTPS protocol for image retrieval.

i) Supports SSH or HTTPS secure remote administration/management.

j) Each camera shall support NTP (Network Time Protocol) client function for time synchronisation, and

k) The department's Project Representative is to engage the respective District ITS Administrator for imaging equipment IP address allocation and necessary network configuration.
Hold Point 2

7.5 Video storage

Understanding the impact of additional CCTV video recording traffic will have on existing ITS network infrastructure is important as insufficient capacity has the potential to lead to poor reliability and, ultimately, impact TMC operational objectives.

The design shall take into account the additional video stream storage requirements that may be needed as part of the project. The department's Project Representative shall be consulted as to the current departmental policy on the retention of video images.

For busway infrastructure, unless otherwise directed by the department's Project Representative, the minimum storage requirements of any additional CCTV capacity shall be based on the Translink Busway Position Paper regarding Vision Management through Needs Analysis Technology & Camera Placement in Appendix A.2.

As part of the detailed CCTV detailed design, the Contractor shall include, in the detailed design report, the details of the storage requirement including, but not limited to:

a) video encoding type

b) video resolution

c) expected scene activity

d) frames per second

e) number of days the video to be retained, and

f) the resultant storage calculation of each individual camera.

The additional storage capacity shall be as directed by the respective District ITS Administrator responsible (through the Transport and Main Roads Project Representative), which may include the following options:

a) additional FLIR Media Archiver unit, and

b) RAID 5 (e.g., single drive redundancy), RAID 6 (e.g., two-drive redundancy) or RAID 10 (e.g., mirrored) storage arrays.

The Contractor shall also define, in the design report, the total additional storage calculation requirement for all cameras supplied under the Contract.

The total additional storage requirement shall form the basis of the requirement for provision of additional Media Archiver Storage arrays in consultation with the department's Project Representative under the Contract.

Where the Contractor is required to supply a new Media Archiver Server to accommodate the additional storage, the Contractor shall undertake the necessary commissioning activities to demonstrate the supplied storage hardware meets the storage requirements.

The respective departmental District ITS Administrator shall be consulted with as to any additional storage requirements as result of additional CCTV capacity.

Should additional network storage be required, this shall be negotiated with the respective District ITS representative.

Where so directed by the department's Project Representative, the Contractor shall supply to the department's Project Representative the required FLIR Failover Recording licenses.

The provision of Failover Recording licenses shall be determined by consultation between the department's Project Representative and the departmental District ITS representative.

The detailed design shall also ensure that any additional Ethernet network bandwidth requirement introduced by the additional CCTV recording capacity does not exceed any part of the existing Ethernet network bandwidth limitation.

Any departmental approved video footage extracted shall be in an encrypted format.

7.6 Safety critical design

Any detailed CCTV design for tunnels, egresses, fire and life safety purposes or any other safety critical function as determined by the ITS Functional design, high availability shall be incorporated and be compliant to AS 61508.

The additional design of cameras for safety critical functions shall comply with the following requirements:

a) the multiple camera design shall be such that any single point of failures are minimised

b) that any tunnel or egress cameras provide overlapping coverage

c) that any hardwired alarms to SCADA or connected PLCs are wired fail safe (i.e., inactive high/closed circuit or active low/open circuit reflects a logical PLC state of OFF/ON respectively via interposing solid-state relays), and

d) cameras shall be connected to an essential power supply or UPS.

8 Equipment requirements

Supplied equipment components, where not otherwise specified, shall be in accordance with the appropriate Australian Standard Specifications where such exist and in their absence, with appropriate British Standard Specifications.

8.1 PTZ IP camera – integrated packages

PTZ cameras shall comply with the following requirements:

a) the camera shall have day/night capability with auto IR compensation

b) the semiconductor imagery shall be of the CCD type with the image chip having a minimum active area of 4.5 mm (¼ inch CCD) diagonal

c) the camera shall provide internal image processing capability to dynamically adjust and compensate for light sources, such as flashlights, headlights, sun glare and other glare sources, thereby allowing the image not to become overexposed or loose image fidelity

d) the camera shall operate with any of supply voltages listed in Clause 10.2

e) the CCTV should be able to deliver colour pictures up to 0.5 lux (day light) (F 1.4, 5600 K, 30 IRE and 60% reflectivity) and black and white pictures up to 0.04 lux (F 1.4, 5600 K, 30 IRE and 60% reflectivity) meeting the performance requirements in Section 6

f) the camera shall possess functionality that enables the automatic activation of black and white mode during low light level periods

g) the camera shall have at least 22x optical zoom and at least 10x digital zoom as a minimum

h) the camera shall have the option to turn off the digital zoom (if required)

i) PTZ view panning shall be 360-degree endless functionality, with a maximum and minimum rotation speed of 120 and 1 degrees/second respectively

j) if available, video signals within the camera shall be transmitted via an optic slip ring and not a mechanical slip ring

k) the camera shall have at least 256 inbuilt pre-set views storage

l) the camera shall possess a 180-degree Digital flip functionality

m) unless otherwise specified, the camera operating environment shall be –40 to 50°C temperature with 0 – 90% non-condensing humidity

n) for outdoor IP PTZ dome cameras installed on standard Transport and Main Roads poles, the camera housing shall be IP66 compliant

o) all PTZ dome cameras installed on a pole shall be secured to the pole by way of a safety wire, chain or other redundant securing mechanism, and

p) Camera shall have image stabilisation inbuilt to provide a stable video image when installed on a pole either fixed or hinged. The poles can be subjected to a vertical deflection allowable in accordance with MRTS97 *Mounting Structures for Roadside Equipment.*

The use of safety chain or wire between the IP PTZ dome camera and a pole helps to reduce the risk of falling objects hazard over the life of cameras mounted on poles and contributes to safe maintenance practises carried by departmental staff and its Contractors.

8.2 Fixed IP camera – integrated package

Integrated Fixed IP camera with housing systems with following performance parameters should be such that width of the nearest general vehicle observation point must result in between 115 pixels/metre and 132 pixels/metre (35 pixels/foot to 40 pixels/foot) resolution with output signal not less than 50 IRE at 0.05 lux.

IP cameras shall comply with following requirements:

a) lens – fixed focal length with auto or P Iris

b) day/night capability with auto IR compensation

c) resolution – meeting above design requirements

d) light sensitivity – minimum of 0.5 lux for colour picture and 0.05 lux for black and white pictures. (F 1.4, 5600 K, 30 IRE and 60% reflectivity)

e) dynamic range – minimum of 60 dB

f) compression – H.264 to facilitate frame rate requirements of 6.2

g) output signal quality – 30 IRE at 0.05 lux

h) power supply – IEE802.3af (PoE).

i) the camera operating environment shall be –10 to 50°C temperature with 0 – 90% non-condensing humidity, and

j) supports secure mechanism for the periodic transfer of images to an IP server source.

8.3 Mega pixel capable IP Camera – integrated package

Mega pixel-based cameras shall comply with the following equipment requirements:

a) at least ½ inch CCD

b) minimum Illumination for full colour and night mode is 0.2 and 0.01 lux respectively

c) minimum resolution of 2048 (H) x 1536 (V)

d) dynamic range of 52 dB

e) SNR of 45 dB

f) zoom down to 32 x 32 pixel window (retrospective zoom)

g) panning within the field of view

h) AGC functionality

i) compression rate H.264

j) complies with video standards WUXGA, HDTV1080P, 3MP, 1.3MP, HDTV720P, XGA, SVGA, PAL, NTSC, VGA, CIF, SIF, and

k) the camera operating environment shall be –10 to 50°C temperature with 0 – 90% non-condensing humidity.

8.4 Camera housing

8.4.1 General

The camera housing shall comply with the following general requirements:

a) each camera shall be enclosed in a weatherproof housing rated for at least IP66

b) the housing, including a sunscreen, shall be corrosion resistant in construction

c) coatings and fittings shall tolerate exposure to salt atmosphere and motor vehicle fumes

d) the camera housing design shall maintain the ambient environment inside the housing to within the rated operating conditions of the equipment it houses in all weather conditions and ambient temperatures likely to be experienced in the installed location

e) the layout of the equipment shall maximise the cooling capabilities of each item of equipment

f) internal and exterior surface finishes shall be white or light grey

g) the camera housing shall be able to be readily and securely adapted to connect to a standard departmental camera pole spigot or via a dedicated shepherds crook camera pole mounting bracket (for some dome type cameras), and

h) if the housing is not a dome type, its weight must be less than 5 kg, including sunshield.

8.4.2 Standalone cameras within PTZ housings

Where approved in writing by the department's Project Representative for the particular project, any non-integrated standalone camera installations that are housed within separate PTZ mechanical units, the following requirement apply:

a) The housing shall include a minimum 100 mm sunscreen to shade the lens from direct sunlight.

b) Cable entries shall be provided, which are able to accept all cables required to enter the housing. The cable entries must be weatherproof to IP66.

c) Depending on the project requirement, a thermostatically-controlled fan may be fitted inside the housing. The fan must operate from the Extra Low Voltage camera supply. The thermostat must switch the fan on for temperatures above 32°C.

d) Internal free space must be provided such that the camera, lens and cables do not interfere with the housing itself.

e) The camera housing window must not introduce any distortion to the video picture.

8.5 Lens for standalone CCTV camera

Where approved by the department's Project Representative and not integrated into the PTZ unit, the optical lens for a standalone CCTV camera shall comply with the following requirements:

a) Lenses shall be a motorised zoom type with a minimum optical zoom ratio of 10:1, with auto iris and position feedback. Focus tracking shall be such that the lens will not require focus adjustment for an object at infinity (> 10 m) over the entire zoom range.

b) The standalone camera lens mount shall be a standard ¼ inch diameter C mount and include a CS lens adaptor.

c) The lens mount shall be ¼ inch diameter CS (or C with C-CS mount adaptor) suitable for attachment to the video cameras described above.

d) Maximum aperture shall be at least F 1.2, with a focus range of 1.2 metres to infinity, and

e) The motorised zoom and auto-iris shall operate from 8 or 12 Volts DC +/-10%.

8.6 Standalone Pan-Tilt unit

Where approved by the department's Project Representative, standalone IP cameras they shall be housed in a dedicated panning and tilting mechanism which complies with the following requirements:

a) this unit shall be capable of continuously panning the camera assembly through 360 degrees in the horizontal plane

b) it shall also be capable of continuously tilting in the vertical plane between +10 degrees and 83 degrees to horizontal

c) the serial communications protocol that the dedicated PTZ mechanism shall be interoperable with the current video management system, FLIR. (i.e., PELCO-AD/P/D)

d) ability to control and monitor video over IP networks

e) H.264, MPEG-4, and MJPEG compression, and

f) multilevel password protection.

8.7 Camera mounting options

8.7.1 General

All camera mounting bracket structures are to be certified by a structural RPEQ. Considerations such as, but not limited to, the following shall form part of the RPEQ certification process:

a) wind loading (e.g., in addition to any existing loads)

b) weight of camera and components (e.g., in addition to any existing loads)

c) support structure suitability and strength (e.g., existing camera pole)

d) bracket mechanism suitability and strength (e.g., recommended manufacturer or custom bracket)

e) environmental factors (e.g., exposed to weather erosion)

f) safety (e.g., safety chain/wire connection)

g) aesthetics (e.g., aligns with general infrastructure aesthetics)

h) maintenance accessibility (e.g., height and readily accessibility by maintenance staff), and

i) other factors as deemed required by the structural RPEQ.

8.7.2 Buildings

In addition to the general requirements, cameras attached to buildings may use the following mounting mechanisms:

a) mounted on a hinged outreach, and

b) inset roof cavity mounted for general public facing infrastructure.

Where the camera is mounted on a building, the designer shall consider the maintenance access with respect to minimising the cost of maintenance.

The use of brackets to enable the camera to be swung into a safe maintenance area should be considered.

The designer should consider ways to ensure the swing bracket cannot be maliciously tampered with by members of the public.

8.7.3 Tunnels

In addition to the general requirements, cameras within tunnels may use the following acceptable mounting mechanisms:

a) camera dropper bracket mounted securely off tunnel cable tray uni-strut support anchors

b) camera dropper bracket mounted securely off pre-approved tunnel anchor points. No ad-hoc manual chemical anchor points or other securing method shall be undertaken on a tunnel ceiling without the prior written approval of the tunnel structural design RPEQ

c) no part of the camera or its mounting bracket shall enter the kinematic envelope of the tunnel

d) cameras shall be positioned carefully such that views are not obscured by jet fans, deluge zone sprinkler nozzles, public announcement speakers, lighting and other obstacles, and

e) cabling to cameras within the tunnel shall be LSZH. Refer to MRTS234 for details.

8.7.4 Roads

In addition to the general requirements, mounting mechanisms for cameras positioned alongside roads shall use comply with the following:

a) Be connected to a swing or hinged standard pole complying with MRTS97 *Mounting Structures for Roadside Equipment* and MRTS61 *Mounting Structures for ITS Devices*, including mounting arrangements. The height of the pole shall be:

   i. 15 m where the footings are installed 3 m or less above of carriageway height, or

   ii. 12 m where the footings are installed higher than 3 m above carriageway height, or

   iii. 8 m where mounted on overpass or other structures, or

   iv. 18 m hinged pole where the footings are installed at carriageway height, subject to meeting the requirements of wind loading and deflection of MRTS97 *Mounting Structures for Roadside Equipment* and vibration not impairing the imaging equipment performance.

v. Where cameras are mounted on a pole, the camera shall have inbuilt image stabilisation compensation.

b) Cameras shall not be mounted on existing poles unless approved in writing by the department's Project Representative and the resulting structure is certified by a structural RPEQ.

c) Dome cameras shall be mounted on a pole outreach/shepherd's crook bracket.

d) A maximum of one camera may be mounted on a camera pole. Should additional cameras be required to be affixed to a single pole, the resultant configuration shall be certified by a structural RPEQ.

e) The pole shall be base plate mounted and be suitable for mounting on a rag bolt assembly in a concrete footing or equivalent. The size and configuration of the rag bolt assembly shall be in accordance with the Standard Drawings for camera poles.

f) Where a hinged camera pole is used, it shall be positioned such that the swing arc is parallel with the adjacent roadway, shall be provided with counter weight according to design calculations and

g) Refer to the *Road Planning and Design Manual* (RPDM) for general clearances required.

It is important that any infrastructure for CCTV is carefully positioned to ensure the general safety of maintenance personnel working alongside roadways.

8.8 Field cabinets

Where required as part the approved detailed design, weatherproof ITS field cabinets shall be supplied to house the local camera control, communications equipment, power supply and all other locally associated equipment.

The field cabinets shall comply with the requirements of Clause 13 of MRTS201 *General Equipment Requirements*. The departmental representative shall be consulted as to the current list of type approved ITS field cabinets in existence. An approved cabinet shall be selected from this list.

The type of cabinets that can be used are below:

a) CCTV Camera Pole Mounted Cabinets

b) Pole Top Cabinets, and

c) Concrete Plinth Mounted Cabinets.

8.9 Naming of cameras

Naming of CCTV cameras must be performed as directed by the principal's representative through the department's Project Representative.

8.10 Camera firmware

All camera infrastructure shall also comply with the following requirements:

a) Cameras shall be supplied with the latest firmware version supported by the manufacturer

b) Firmware upgrades shall be provided by the manufacturer for the duration of camera life-cycle. The minimum camera life-cycle shall be five years

c) Firmware updates shall be able to be compatible with the version of firmware supplied with the device for the stated life-cycle of the device

d) Any firmware provided shall be shown to have all pre-existing problems, errors or issues resolved prior to being applied to the device in operation

Throughout the life-cycle of a device, firmware updates will need to be provided to resolve previously encountered issues and also allow for general enhancement. However, it is important that the firmware update is thoroughly tested by the manufacturer or supplier such that any pre-existing issues, problems and errors are resolved prior to applying the update to the operational device. Failure to adhere to this will likely result in less stable device operating behaviour which may affect business outcomes due to outages and disruptions.

e) Encoder (where approved by the department's Project Representative) shall have the latest firmware revision, and

f) All CCTV equipment which contains firmware shall be loaded with the latest version from the product vendor prior to commissioning activities being conducted.

9 Environmental requirements

The environmental requirements defined in MRTS201 *General Equipment Requirements* apply to this Technical Specification.

10 Electrical requirements

10.1 Mains power supply

Where mains power is required, the relevant electrical requirements defined in Clause 10 of MRTS201 *General Equipment Requirements* apply to this Technical Specification.

Mains power supply shall be connected to the ITS cabinet from which the cameras are powered.

10.2 Battery power

Where mains power is required, also provide a battery power supply in accordance with Clause 10 of MRTS201 *General Equipment Requirements* for the communications equipment.

10.3 Solar power

Where solar power is specified, the requirements defined in MRTS263 *Standalone Solar (PV) Power Systems* apply to this Technical Specification.

10.4 Uninterruptable Power Supplies (UPS)

Where camera infrastructure is used for critical surveillance purposes, such as incident detection, tunnels and other areas where the general public frequent, a UPS or an essential power source shall be provided. Where a UPS is specified, the relevant electrical requirements defined in Clause 10 of MRTS201 *General Equipment Requirements* apply to this Technical Specification.

Where cameras are located within a tunnel or tunnel egress, the tunnel essential services power supply shall be utilised to provide the backup power. The Contractor shall confirm the requirement for UPS backup with the contract Administrator prior to commencing the design.

10.5 Surge protection

Surge protection devices shall be provided on imaging equipment in accordance with Clause 10 of MRTS201 *General Equipment Requirements* whether or not the site is assessed to AS 1768 to be susceptible to lightning.

10.6 Camera power source

The following options can be used to provide power supply to imaging equipment:

a) 24 Vac +/- 5%, 50Hz +/- 1%

b) 24 Vdc +/- 5%

c) IEEE802.3af Power Over Ethernet (PoE) – only when cooling fan option is not used, and

d) IEEE802.3at compliant (PoE+).

However, the most appropriate method should be selected after proper evaluation of the requirements of the site and factors such as capability of other hardware (e.g., data switches). The Principal's approval shall be obtained for the selected method of powering the equipment.

The electrical design for camera installations, including multiple camera installations, shall ensure that the voltage at each camera is always within the specified camera operating limits taking into account the electricity entity's allowable voltage variations. ELV power supplies shall be suitably rated for the number of cameras connected.

> It is important that the power supply is sized correctly for the connected cameras. In some cases in the past, camera power supplies were too small and this resulted in cameras continually starting up as they did not have sufficient energy to complete the start-up cycle.

11 Telecommunication requirements

The telecommunication requirements defined in MRTS201 *General Equipment Requirements* apply to this Technical Specification. All telecommunications equipment shall comply with relevant Australian Communications and Media Authority technical standards and requirements.

11.1 Performance requirements

Where images are not transmitted between the field cabinet and TCP/IP server entirely by fibre, each camera shall be provided with a telecommunications channel with a bandwidth of at least 256/64 kbps to the TMC or IP server as designed (this bandwidth may be shared with a STREAMS data network for Traffic Signal Control and other users, only if such sharing will not limit the capability and usability of both systems).

11.2 Public telecommunication services

Provision for telecommunications lines shall be provided in accordance with the requirements of ACIF and AS/NZS 3085.1.

11.2.1 Permanent

Contractors shall contact the department's Project Representative to discuss what existing telecommunications infrastructure is available for use by project (fibre, microwave, existing IPRT service). If a new IPRT service is required (or change to the service) the department's Project Representative shall contact IPRT WAN support.

The Contractor shall contact the department's Project Representative should there be a requirement to arrange for a connection of a public telecommunications service to the site. This shall be done within 14 days of identifying the requirement based on the ITS functional design or detailed design.

The department's Project Representative shall liaise internally (IPRT WAN support) and with the currently nominated telecommunications service provider to implement the required service. All telecommunications services shall be those as approved by the department's Engineering and Technology section.

The Contractor shall agree with the department's Project Representative as to the required the date of the permanent service. The Contractor shall pay any setup costs for the service.

11.3 Cabling

Camera cabling shall comply with the following requirements:

a) Sufficient slack cable of all camera communications and electrical (ELV only) shall be installed within the hinged pole/swing arc pole.

> For those cameras mounted to swing arc/hinged poles, it is important that the installed allows sufficient slack in the cable to allow for when the pole is access for maintenance. This will help to ensure the life of a camera installation is maximised.

b) Lightning surge protection shall be installed on all communication cabling to the camera. Surge diverters shall be located in the base of the pole and the camera cabinet.

c) All unused camera cabling shall be terminated.

d) All underground rated CAT5/5E cabling shall be terminated onto a RJ45 patch rack.

e) All underground rated SMOF cabling shall be terminated onto a suitably sized SC/APC fibre optic patch rack or Fibre Optic Break Out Terminal (FOBOT).

f) All copper Ethernet devices (10/100 Base-Tx) shall be connected with standard CAT5/5E patch cables pre terminated with EIA/TIA568 RJ45 connectors.

g) All fibre Ethernet devices (10/100 Base-Fx) shall be connected with duplex SMOF patch leads pre terminated with SC/APC or LC/PC duplex connectors as per MRTS234.

h) Any underground cabling for power shall comply with AS/NZS 3000 and be sufficiently robust and resilient with XLPE compliant sheathing.

i) No cable joints are allowed within the communications or electrical (if not PoE) between the connecting ITS network Ethernet switch device.

j) Where the Ethernet limit of 90 m is exceeded, the preferred communications transmission method shall be Single Mode Optic Fibre (SMOF). Ethernet/PoE extenders shall not be used.

k) Multimode Optical fibre or associated equipment shall not be used.

l) Cabling requirements of MRTS234 shall apply where applicable, and

m) For cameras mounted on poles, the cable shall be supported internally at the top of the pole with a stainless steel cable sock to ensure no tension is placed on the connection to the camera and no damage is incurred to the cable sheaths at pole entry/exit points.

12 Systems integration requirements

In some cases, the department's video system is integrated with other departmental systems and the Contractor shall ensure that all necessary integration activities are undertaken. **Hold Point 3**

Transport and Main Roads has a number of systems and a number of these are integrated. System integration assists TMC operators in their day-to-day operational activities by providing additional contextual information in regard to incidents. In some cases, a door is opened and this provides an alert to a central management system which then automatically displays the relevant camera video stream to an operator.

12.1 SCADA systems – busways infrastructure only

Provision to engage the services of the respective departmental ITS Administrator (and associated specialist Contractors if required) shall be made to ensure that any additional video system capacity is fully integrated with existing SCADA systems.

The department's Project Representative shall be consulted as to the existing integration activities required to be undertaken.

This may include, but not limited to, the following requirements:

a) making adjustments to the SCADA system head-end software (e.g., to allow for new camera locations, not video, to be displayed on a SCADA HMI/GUI)

b) making adjustments to the SCADA server software (e.g., to allow the receipt of command messages associated with PLC SCADA inputs and other departmental systems to be forwarded to the FLIR video system)

c) configuring FLIR to allow for the incoming SCADA integration messages to processed (e.g., to automatically activate selected pre-set views of any of the additional cameras), and

d) configuring associated devices (e.g., PLCs if any I/O is required to be accepted/actuated respectively).

12.2 VOIP Help Point systems – busways infrastructure only

Provision to engage the services of the respective departmental ITS Administrator (and associated specialist Contractors if required) shall be made to ensure that any additional video system capacity is fully integrated with existing VOIP Help Point systems.

The department's Project Representative shall be consulted as to the existing integration activities required to be undertaken.

This may include, but not limited to, the following:

a) configuration of the VOIP Help Point system to enable the additional VOIP Help Point(s) (if any) delivered to exchange integration messages with the existing SCADA system.

12.3 Access Security Systems – busways infrastructure only

Provision to engage the services of the respective departmental ITS Administrator (and associated specialist Contractors if required) shall be made to ensure that any additional video system capacity is fully integrated with existing Access Security Systems.

The department's Project Representative shall be consulted as to the existing integration activities required to be undertaken.

This may include, but not limited to, the following requirement:

a) Configuration of the Access Security System to enable the additional Access Security Monitored point(s) (if any) delivered to exchange messages with the existing SCADA system).

13 Testing and commissioning requirements

13.1 General

The Contractor must demonstrate compliance of each ITS system, device and associated infrastructure with the requirements of the Contract by performing:

a) Installation Acceptance Tests (IAT)

b) Commissioning Tests (CT), and

c) Customer (Field) Acceptance Tests (CAT).

All above plans shall be submitted to the department's Project Representative for review at least 28 day prior to the commencement of any testing.

The Contractor shall seek the written approval of the respective plans at least 28 days prior to commencement of any testing or commissioning activities. **Hold Point 4**

Each plan must detail the customised tests, test sheets and procedures for each ITS device and associated infrastructure.

Each test must be shown as a Milestone on the Contractor's schedule of works.

Test plans and record sheets must be suitable for recording compliance with the respective technical requirements of the Contract.

The IAT plan must address as a minimum:

a) electrical tests

b) equipment and/or system operation, and

c) compliance with the respective functional and operational requirements.

Test plans must include different traffic volumes and weather/lighting conditions where these may be reasonably expected to impact on the performance and/or accuracy of the device and/or system.

The Contractor must identify and provide all equipment, materials and other works necessary to perform the tests. Any damage incurred as a result of undertaking tests must be rectified by the Contractor.

13.2 Camera configuration activities

All cameras shall be configured prior to connection to the department's ITS network including, but not limited to, the following configuration activities:

Carried out by the Contractor:

a) programming of IP Address as provided by ITS Project Representative

b) programming of Subnet Mask as provided by ITS Project Representative

c) programming of Default Gateway as provided by ITS Project Representative

d) programming of NTP service (where applicable), and

e) programming of DNS service (where applicable).

The Contractor undertakes the basic network configuration to allow the devices to be visible on the department's ITS network after which the District ITS Administrator (in association with the department's Nominated ITS Network Manager) can finalise the network connectivity configurations required. This ensures the security of department's ITS network information is maintained.

Carried out by the relevant District ITS Administrator:

a) programming of approved username and password device authentication credentials

b) removal of any unused user accounts

c) configuration of video stream for recording

d) configuration of video stream for live viewing

e) configuration of web interface (if applicable), and

f) disablement of unused camera management services (e.g., telnet, HTTP, etc.), and

g) enablement of secure management services (e.g., SSH, HTTPS, etc.).

13.3 Network switch configuration activities

Any network modifications required for integration of video equipment will be in accordance with the MRTS245 *ITS Telecommunications Network (ITS TN)*.

13.4 FLIR system configuration activities

Once all additional camera components have been commissioned to the point of connection to the existing system (including any Ethernet switches), the Contractor shall contact the relevant District departmental ITS Administrator to undertake the following FLIR AdminCentre configuration activities for all the additional camera capacity to be integrated into the existing departmental video system:

a) discovery of additional camera entities

b) scan sequences

c) motion detection alarms

d) attaching new cameras to the relevant archiver

e) creating directory server branches for new cameras

f) setting up logical IDs for each camera

g) setting up the display name/label for each camera, and

h) any other required configuration activities based on the ITS functional design.

If requested by the relevant District ITS Administrator, all new necessary licences for any additional cameras, directory servers, failovers shall be procured and the licence file supplied to the department's Project Representative for submission to the relevant District ITS Administrator. **Hold Point 5**

13.5 Installation acceptance tests

Once installed on site, the Contractor must demonstrate and certify that the equipment has been installed to allow correct operation.

Compliance details of all respective components as required or implied under this document must be included in the operations manuals prior to commencement of the CT. **Hold Point 6**

13.6 Commissioning tests

The equipment must be commissioned by integrating the operation, monitoring and control with other equipment and/or systems as appropriate. This must include initialising performance parameters to suit the site-specific function of operation.

Commissioning must prove the correct operation, monitoring and control as required to meet the requirements of the Contract.

Where the Contractor supplies a new Media Archiver Server and Storage Array as part of the Contract, the Contractor shall carry out commissioning activities to demonstrate the video storage retention requirements are met as per the original agreed requirements, based on the detailed design report for storage requirement.

Unless otherwise specified by the department's Project Representative, the commissioning test sheets in Appendix A shall form the minimum requirement. Compliance details of all respective components as required or implied under this document must be included in the operations manuals prior to commencement of the CT. **Hold Point 7**

13.7 Customer acceptance testing

Commissioned equipment and/or systems must simulate continuous operation under normal operating conditions for a period of 15 consecutive days (hereafter referred to as CAT period).

Failure of the equipment and/or system to meet the requirements in the Technical Specifications for more than three hours (accumulated) during the CAT period shall be cause for the CAT to be repeated for the full duration of the CAT period.

Once commenced, the CAT period need not be restarted provided that the failure is not caused as a result of the Contractor's works in the following events:

a) unavailability of the Principal-supplied equipment and/or systems, and/or

b) failure (not attributable to the Contractor) of a telecommunication channel leased by the Principal to transmit data.

The following documents must be included in the operations manuals prior to handover. **Hold Point 8**:

a) a statement confirming the warranty provisions associated with the tested device and associated equipment, and

b) compliance details of all respective components as required or implied under this document.

14 Documentation requirements

In addition to the documentation requirements defined in MRTS201 *General Equipment Requirements*, the following documentation shall be provided to the department's Project Representative (in both electronic and bounded hardcopy forms): **Hold Point 9**

a) final ITS Functional Design (including CCTV)

b) copies of permanent/temporary communications service

c) RPEQ Certified Detailed Design (e.g., for electrical and structural components)

d) signed Electrical Test Certificates and Form 8008 Accessing Electrical Work Request (Form 2) connections (e.g., POS connections)

e) signed Test and Commissioning Checklists/Sheets

f) all CCTV manufacturer O&M manuals

g) supplied drawings will be provided in the department's requested format – e.g., Microsoft Visio 2003 or higher, AutoCAD, etc.

h) all manufacturer/supplier device warranty certificates, and

i) all copies of updated firmware/software used during commissioning, conducting general administration or maintenance activities, and

j) Detailed Design Report.

15 Training requirements

The training requirements defined in MRTS201 *General Equipment Requirements* apply to this Technical Specification. **Hold Point 9**

16 Maintenance requirements

The maintenance requirements defined in MRTS201 *General Equipment Requirements* apply to this Technical Specification. Maintenance documentation should contain copy of all the necessary software and essential hardware to configure the equipment. **Hold Point 9**

17 Handover requirements

The handover requirements defined in MRTS201 *General Equipment Requirements* apply to this Technical Specification. In addition, product at handover should contain the latest approved software. All asset information, as required by Principal, should be provided by the time of handover.
Hold Point 9

Appendix A: Generic CCTV Commissioning Test (CT) Sheets

CT: COMMISSIONING REPORT SHEET

CLOSED CIRCUIT TV CAMERA

		FORM NO: CCTV-CT-CRS	Rev3.0

1.0	CCTV INFORMATION (prefilled by contractor prior to commissioning)	
1.1	TMR Project Name:	
1.2	Test Date (DD-MM-YY):	
1.3	Camera Number:	Project Reference: / DVTel:
1.4	DVTel Camera License:	PRIMARY Channel Lic: / FAILOVER Channel Lic:
1.5	As Constructed Dwg Details:	No. / Rev:
1.6	Location Description / Address:	Circle: Road, Bridge, Bldg, Bus.Station, Bus.Stop
1.7	GPS Co-ordinates (WGS84 format):	Lat: / Long:
1.8	CCTV Installation Type:	Circle: Swing Pole, Height: 8m, 10m, 12m, 15m, __m; Mounting: Outreach: Single, Double, Design Approved; Pole Top, Building, Ceiling
1.9	IP CCTV Type:	Circle: PTZ: Integrated, Design Approved; FIXED: Dome, Web, Mega Pixel; Brand: / Model: / Serial No.:
1.10	Camera Power Type:	Circle: PoE: IEEE802.ae (15.4W), IEEE802.et (30W); p/s: 12Vdc, 24Vac, Design Approved; Brand: / Model: / Serial No.:
1.11	Camera IP Details:	IP Address: / Subnet Mask: / Gateway: / MAC Address:
1.12	Connected Ethernet Switch Details:	TMR Switch ID: / Port No.:
1.13	PTZ Details:	Protocol: / Baud Rate: / ID:
1.14	TMC Commissioning Reference No.:	

2.0	PRE-CHECKS PRIOR TO COMMISSIONING			
	Test Step	**Expected Condition/ Result**	**Pass / Fail / NA**	**Signed**
2.1	Check that an IAT has been performed for each Camera and labels fitted	IAT available on site at time of commissioning.		
2.2	As Constructed Drawing	Verify the installation matches the As Constructed drawing		
2.3	Check Traffic Management Centre connectivity available	All switches on sites are on at the time of testing		
2.4	Check DVTel programming	CCTV is identified correctly on the DVTel Tree and in the right location.		
2.5	DVTel Presets	Presets have been programmed into DVTel system.		
2.6	Surge Protection	Surge protection present in both the cabinet and at the camera.		
2.7	Camera Pole Cable Support System	Cables installed in poles are supported vertically by appropriate cable support and there is no evident damage to cable insulation at pole penetrations.		

3.0	Functional Testing from Network Video Management System (DVTel)			
	Test Step	**Expected Condition/ Result**	**Pass / Fail / NA**	**Signed**
3.1	Pan	360 Degree panning		
3.2	Tilt	+10 to -90 Degree from horizontal		
3.3	Focus	1.2m to Infinity		
3.4	Zoom	Minimum to Maximum Zoom of an object and ensure focus tracking		
3.5	Day Contrast	Detail in observed image is acceptable to TMC operator		
3.6	Night Contrast	Detail in observed image is acceptable to TMC operator (confirms CCTV camera is back focused)		
3.7	Pre-set PTZ	CCTV camera consistently rotates to a pre-set PTZ command		
3.8	PTZ performance	A full PTZ from one extreme to the other is performed to check circuit breaker does not trip.		
3.9	Check comms auto recovery	Disconnect Ethernet comms from switch and check camera auto reconnects with DVTel		
3.10	Check power auto recovery	Power cycle camera and check auto reconnects with DVTel		
		Switch main circuit breaker, PoE device, Power supply or connected Ethernet Switch and check auto reconnects with DVTel (if applicable)		

SUMMARY OF DEFECTS - Record Information of Tests above that are a "Fail"					
	CT ref.	Defect Description	Rectification Required by	Date Fixed	Signed
a.					
b.					
c.					
d.					
e.					

5.0	QUALITY ASSURANCE CLOSEOUT SIGN OFF
Contractor's Representative Name (Printed)……Signature……..Date……	
TMR Project Representative Name (Printed)……Signature……..Date……	
Independent Verifier (if Applicable) Name (Printed)……Signature……..Date……	