Technical Specification

Transport and Main Roads Specifications
MRTS225 Imaging

October 2014
## Contents

1. **Introduction** .......................................................................................................................... 1
2. **Definition of terms** ............................................................................................................... 1
3. **Reference documents** ........................................................................................................... 4
4. **Quality system requirements** ............................................................................................... 5
   4.1 Hold Points, Witness Points and Milestones ........................................................................ 5
   4.2 Sample for acceptance ......................................................................................................... 6
5. **Functional requirements** ..................................................................................................... 6
   5.1 Functional design .................................................................................................................. 6
   5.2 PTZ IP Camera .................................................................................................................... 6
   5.3 Standard fixed IP camera .................................................................................................... 6
   5.4 Mega Pixel cameras ............................................................................................................. 8
6. **Performance requirements** .................................................................................................. 9
   6.1 General ................................................................................................................................ 9
   6.2 Image data rate ...................................................................................................................... 9
   6.3 PTZ CCTV applications - roadway .................................................................................... 10
      6.3.1 Type “P” (Pedestrian) applications ................................................................................ 10
      6.3.2 Type “V” (Vehicle) applications ..................................................................................... 10
   6.4 PTZ CCTV applications – busway ..................................................................................... 10
   6.5 CCTV control system ........................................................................................................... 10
7. **Design requirements** ............................................................................................................. 11
   7.1 General CCTV system Ethernet communications architecture ........................................... 11
   7.2 General requirements ........................................................................................................... 11
   7.3 Location selection ................................................................................................................ 12
   7.4 Networking and security ..................................................................................................... 12
   7.5 Video storage ....................................................................................................................... 12
   7.6 Safety critical design ........................................................................................................... 14
8. **Equipment requirements** ...................................................................................................... 15
   8.1 Fixed IP camera - integrated package ................................................................................ 15
   8.2 Mega Pixel camera - integrated package ............................................................................ 15
   8.3 Camera housing .................................................................................................................... 16
      8.3.1 General ........................................................................................................................ 16
      8.3.2 Standalone cameras within PTZ housings .................................................................... 16
   8.4 Lens for standalone CCTV camera ...................................................................................... 17
   8.5 Standalone pan-tilt unit ........................................................................................................ 17
   8.6 PTZ camera - integrated packages ...................................................................................... 17
   8.7 Camera mounting options .................................................................................................... 18
      8.7.1 General ........................................................................................................................ 18
      8.7.2 Buildings ....................................................................................................................... 19
      8.7.3 Tunnels .......................................................................................................................... 19
      8.7.4 Roads ............................................................................................................................ 19
8.8 Field cabinets ........................................................................................................... 20
8.9 Naming of cameras ................................................................................................. 20
8.10 Camera firmware .................................................................................................... 20
9 Environmental requirements ...................................................................................... 20
10 Electrical requirements ............................................................................................ 21
10.1 General ................................................................................................................... 21
10.2 Mains power supply ............................................................................................... 21
10.3 Protection device .................................................................................................... 21
10.4 Camera power source ............................................................................................ 21
10.5 Uninterruptable Power Supplies (UPS) .................................................................. 22
10.6 Surge protection ..................................................................................................... 22
10.7 Electrical testing ..................................................................................................... 22
11 Telecommunication requirements .............................................................................. 22
11.1 Performance requirements ..................................................................................... 23
11.2 Public telecommunication services ....................................................................... 23
   11.2.1 Permanent ......................................................................................................... 23
   11.2.2 Temporary .......................................................................................................... 23
11.3 Cabling .................................................................................................................. 23
12 Systems integration requirements .............................................................................. 24
12.1 SCADA systems – busways infrastructure only ...................................................... 24
12.2 VOIP Help Point systems – busways infrastructure only ......................................... 25
12.3 Access Security Systems – busways infrastructure only ......................................... 25
13 Testing and commissioning requirements .................................................................... 25
13.1 General ................................................................................................................... 25
13.2 Camera configuration activities ............................................................................... 26
13.3 Network switch configuration activities ................................................................... 26
13.4 DVTel system configuration activities .................................................................... 27
13.5 Installation acceptance tests ................................................................................... 27
13.6 Commissioning tests .............................................................................................. 27
13.7 Customer acceptance testing .................................................................................. 27
14 Documentation requirements ...................................................................................... 28
15 Training requirements ............................................................................................... 28
16 Maintenance requirements ......................................................................................... 28
17 Handover requirements ............................................................................................... 29
Appendix A – Generic CCTV Commissioning Test (CT) Sheets ........................................... 30
1 Introduction

This 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 Specification. Refer to MRTS250 for ANPR requirements definition.

The scope of this 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
e) provision of permanent and temporary telecommunications services necessary
f) all design, documentation, supply, installation, disconnection, removal, relocation, connection, testing and commissioning of the above mentioned works
g) supply of DVTel video channel license – 1 per camera, and
h) supply of DVTel failover video channel licenses as required.

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 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 specification, the contractor shall undertake the work in consultation with the TMR project representative.

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

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

2 Definition of terms

For the purpose of this Specification, in addition to those defined in Clause 2 of MRTS01 the definitions in Table 2 apply.

Table 2 – Definitions

<table>
<thead>
<tr>
<th>Term</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>ADSL</td>
<td>Asynchronous Digital Subscriber Line</td>
</tr>
<tr>
<td>Term</td>
<td>Definition</td>
</tr>
<tr>
<td>-----------</td>
<td>-------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>AGC</td>
<td>Automatic Gain Control</td>
</tr>
<tr>
<td>CAT</td>
<td>Customer Acceptance Tests</td>
</tr>
<tr>
<td>CAT5/5E</td>
<td>Category 5 Ethernet copper cabling</td>
</tr>
<tr>
<td>CCD</td>
<td>Charge Coupled Device / Photo sensor</td>
</tr>
<tr>
<td>CCTV</td>
<td>Closed Circuit Television</td>
</tr>
<tr>
<td>CIF</td>
<td>Common Intermediate Format</td>
</tr>
<tr>
<td>CMS</td>
<td>Changeable Message Sign</td>
</tr>
<tr>
<td>Codec</td>
<td>Device or computer program capable of encoding or decoding a digital data stream or signal.</td>
</tr>
<tr>
<td>COTS</td>
<td>Commericially Off the Shelf</td>
</tr>
<tr>
<td>CPTED</td>
<td>Crime Prevention Through Environmental Design</td>
</tr>
<tr>
<td>CT</td>
<td>Commissioning Tests</td>
</tr>
<tr>
<td>DNS</td>
<td>Domain Naming System</td>
</tr>
<tr>
<td>E&amp;T</td>
<td>Engineering and Technology Branch</td>
</tr>
<tr>
<td>EFLI</td>
<td>Earth Fault Loop Impedance</td>
</tr>
<tr>
<td>ELV</td>
<td>Extra Low Voltage</td>
</tr>
<tr>
<td>FTP</td>
<td>File Transfer Protocol</td>
</tr>
<tr>
<td>GPO</td>
<td>General Purpose Outlet</td>
</tr>
<tr>
<td>GUI</td>
<td>Graphical User Interface</td>
</tr>
<tr>
<td>GWIP</td>
<td>Government Wideband IP</td>
</tr>
<tr>
<td>HMI</td>
<td>Human Machine Interface</td>
</tr>
<tr>
<td>HSDPA</td>
<td>High-Speed Downlink Packet Access</td>
</tr>
<tr>
<td>HSUPA</td>
<td>High-Speed Uplink Packet Access</td>
</tr>
<tr>
<td>HTTP</td>
<td>Hyper Text Transfer Protocol</td>
</tr>
<tr>
<td>HTTPS</td>
<td>Hyper Text Transfer Protocol Secure</td>
</tr>
<tr>
<td>I/O</td>
<td>PLC Inputs/Outputs</td>
</tr>
<tr>
<td>IAT</td>
<td>Installation Acceptance Tests</td>
</tr>
<tr>
<td>Image Quality</td>
<td>Parameters of image information such as resolution, colour, contrast and image refresh rate.</td>
</tr>
<tr>
<td>Imaging equipment</td>
<td>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.</td>
</tr>
<tr>
<td>IRE</td>
<td>An IRE is a unit of measurement used to represent the value of composite video signal on a normalized scale.</td>
</tr>
<tr>
<td>kbps</td>
<td>Kilo Bits Per Second</td>
</tr>
<tr>
<td>LCS</td>
<td>Lane Control Sign</td>
</tr>
<tr>
<td>Term</td>
<td>Definition</td>
</tr>
<tr>
<td>------</td>
<td>------------</td>
</tr>
<tr>
<td>Local electricity supply authority</td>
<td>Interchangeable between local authorities responsible for electricity distribution network and/or retail sale of electricity.</td>
</tr>
<tr>
<td>LSZH</td>
<td>Low Smoke Zero Halogen</td>
</tr>
<tr>
<td>MAC</td>
<td>Media Access Control</td>
</tr>
<tr>
<td>MCB</td>
<td>Miniature Circuit Breaker</td>
</tr>
<tr>
<td>MP</td>
<td>Mega Pixel</td>
</tr>
<tr>
<td>NATA</td>
<td>National Association of Testing Authorities</td>
</tr>
<tr>
<td>NTP</td>
<td>Network Time Protocol</td>
</tr>
<tr>
<td>Pixels per metre</td>
<td>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.</td>
</tr>
<tr>
<td>PLC</td>
<td>Programmable Logic Controller</td>
</tr>
<tr>
<td>PoE</td>
<td>Power over Ethernet (IEEE802.3af)</td>
</tr>
<tr>
<td>PoE+</td>
<td>Power over Ethernet (IEEE802.3at)</td>
</tr>
<tr>
<td>POS</td>
<td>Point of Supply</td>
</tr>
<tr>
<td>PSSEM</td>
<td>Public Safety, Security and Emergency Management (Program)</td>
</tr>
<tr>
<td>PTZ</td>
<td>Pan-Tilt-Zoom</td>
</tr>
<tr>
<td>RAID</td>
<td>Redundant Array of Independent Disks</td>
</tr>
<tr>
<td>RCD</td>
<td>Residual Current Device</td>
</tr>
<tr>
<td>District ITS Administrator</td>
<td>An authorised Public Service Officer who is responsible for the administration of respective District ITS infrastructure.</td>
</tr>
<tr>
<td>RPEQ</td>
<td>Registered Professional Engineer of Queensland</td>
</tr>
<tr>
<td>SCADA</td>
<td>Supervisory Control and Data Acquisition</td>
</tr>
<tr>
<td>SFTP</td>
<td>Secure File Transfer Protocol</td>
</tr>
<tr>
<td>SNR</td>
<td>Signal To Noise Ratio</td>
</tr>
<tr>
<td>SSH</td>
<td>Secure Shell</td>
</tr>
<tr>
<td>The Principal’s TMC</td>
<td>Transport and Main Roads (TMR) State of Queensland Traffic Management Centres.</td>
</tr>
<tr>
<td>TMC</td>
<td>Traffic Management Centre</td>
</tr>
<tr>
<td>TMR Project Representative</td>
<td>A responsible and authorised Public Service Officer representing TMR on a given project.</td>
</tr>
<tr>
<td>Type Approved</td>
<td>Devices that are type approved, have undergone internal evaluation and can be used by projects and their contractors on TMR infrastructure. Existing approvals subject to review at any time.</td>
</tr>
<tr>
<td>UPS</td>
<td>Uninterruptable Power Supply</td>
</tr>
<tr>
<td>VLAN</td>
<td>Virtual Local Area Network</td>
</tr>
<tr>
<td>VMS</td>
<td>Variable Message Sign</td>
</tr>
<tr>
<td>VOIP</td>
<td>Voice Over IP Technology</td>
</tr>
<tr>
<td>VSL</td>
<td>Variable Speed Limit</td>
</tr>
<tr>
<td>Wiring Rules</td>
<td>AS/NZS 3000</td>
</tr>
</tbody>
</table>
3 Reference documents

The requirements of the referenced documents listed in Table 3 of MRTS201 General Equipment Requirements and Table 2 below apply to this Specification. Where there are inconsistencies between this Specification and the referenced MRTS documents, the requirements specified in this Specification shall take precedence.

Table 2 - References

<table>
<thead>
<tr>
<th>Document</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>AS 1768</td>
<td>Lightning Protection</td>
</tr>
<tr>
<td>AS 3000</td>
<td>Electrical installations (known as the Australian/New Zealand Wiring Rules)</td>
</tr>
<tr>
<td>AS 3015</td>
<td>Electrical installations – Extra-low voltage DC power supplies and service earthing within public telecommunications networks.</td>
</tr>
<tr>
<td>AS 3085.1</td>
<td>Telecommunications installations - Administration of communications cabling systems - Basic requirements</td>
</tr>
<tr>
<td>AS 3100</td>
<td>Approval and test specification</td>
</tr>
<tr>
<td>AS 4117</td>
<td>Surge protection devices to telecommunication applications</td>
</tr>
<tr>
<td>AS 4262.1</td>
<td>Telecommunication over voltages - part 1 Protection of Persons</td>
</tr>
<tr>
<td>AS 4262.2</td>
<td>Telecommunication over voltages - part 2 Protection of Equipment</td>
</tr>
<tr>
<td>AS 4806</td>
<td>Closed Circuit Television (CCTV)</td>
</tr>
<tr>
<td>AS 60529</td>
<td>Degrees of protection</td>
</tr>
<tr>
<td>AS 62040</td>
<td>Uninterruptible Power Systems</td>
</tr>
<tr>
<td>AS 65108</td>
<td>Functional safety of electrical/electronic/programmable electronic safety-related systems</td>
</tr>
<tr>
<td>AS ISO 9001</td>
<td>Quality Management Systems – Requirements</td>
</tr>
<tr>
<td>FORM 8008</td>
<td>Accessing Electrical Work Request (Form2)</td>
</tr>
<tr>
<td>IS18</td>
<td>QGCIO Information Security Standard</td>
</tr>
<tr>
<td>MRTS01</td>
<td>Introduction to Technical Specifications</td>
</tr>
<tr>
<td>MRTS50</td>
<td>Specific Quality System Requirements</td>
</tr>
<tr>
<td>MRTS61</td>
<td>Mounting Structures for ITS Devices</td>
</tr>
<tr>
<td>MRTS91</td>
<td>Conduits and Pits</td>
</tr>
<tr>
<td>MRTS95</td>
<td>Switchboards and Cables</td>
</tr>
<tr>
<td>MRTS200</td>
<td>General Requirements for Intelligent Transport Systems Infrastructure</td>
</tr>
<tr>
<td>MRTS201</td>
<td>General Equipment Requirements</td>
</tr>
<tr>
<td>MRTS210</td>
<td>Provision of Mains Power</td>
</tr>
<tr>
<td>MRTS226</td>
<td>Telecommunications Field Cabinets</td>
</tr>
</tbody>
</table>
4 Quality system requirements

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

4.1 Hold Points, Witness Points and Milestones

The Hold Points, Witness Points and Milestones applicable for this Specification are summarised in Table 4.1.

Table 4.1 – Hold Points

<table>
<thead>
<tr>
<th>Clause</th>
<th>Hold Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>5.1</td>
<td>1. Functional Design to be developed and provided to the TMR Project Representative for review and approval 14 days prior to any Detailed Design being undertaken by the contractor.</td>
</tr>
<tr>
<td>7.4</td>
<td>2. Additional CCTV infrastructure is network enabled by the department’s Nominated ITS Network Management Party.</td>
</tr>
<tr>
<td>10.7</td>
<td>3. Written acceptance of design documents and proposed switchboard, cabling works and planned disruptions to existing connected loads.</td>
</tr>
<tr>
<td>12.0</td>
<td>4. Systems integration undertaken (if applicable as determined by the department’s Project Representative).</td>
</tr>
<tr>
<td>13.1</td>
<td>5. IAT, CT and CAT plans to be submitted to the department’s Project representative 28 days prior to any testing commencing.</td>
</tr>
<tr>
<td>13.4</td>
<td>6. All DVTel licences shall be provided for system and configuration completion.</td>
</tr>
<tr>
<td>13.5</td>
<td>7. Equipment certified and in compliance of all respective components.</td>
</tr>
<tr>
<td>13.6</td>
<td>8. Equipment commissioned and in compliance of all respective components.</td>
</tr>
<tr>
<td>13.7</td>
<td>9. Customer acceptance following end-to-end deployment.</td>
</tr>
<tr>
<td>14.0-17.0</td>
<td>10. Handover of all requested project documentation, software, agreed maintenance spares and any other deliverables agreed as part of project delivery.</td>
</tr>
</tbody>
</table>

Quality system requirements for this contract shall be in accordance with this Specification, MRTS01 and MRTS50.
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 Specification.

### 4.2 Sample for acceptance

The requirements defined in MRTS201 apply to this 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) be seamlessly integrated with the Principal’s existing departmental video system, (currently based on DVTel 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 Camera

Fully integrated IP network enabled Pan Tilt Zoom (PTZ) cameras shall be used as part of an overall Traffic Management System. This type of camera shall provide high resolution video feeds / images to the Principal’s traffic management operators to:

- 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 public infrastructure shall be of the fully integrated and enclosed dome type.

Where required by the ITS functional Design and as applicable to Busways 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:

i. A fully integrated dome type where the PTZ mechanism is fully integrated into the dome, or

ii. 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.

Virtual PTZ zones within Mega Pixel IP cameras can be used.

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 than their analog counterparts. Some low powered cameras can also be powered over the same Ethernet cable used for the video signal.

5.3 **Standard fixed IP camera**

Fixed IP cameras shall only be used 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 eleven Information Privacy Principles (IPPs). The images may be used but not limited to the following 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 TMR project representative).

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 whilst 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 DVTel 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 cameras

Mega Pixel cameras provide high resolution images capable of capturing images that can be used for the identification of persons.

At a minimum, Mega Pixel cameras shall support H.264 compression.

The ITS functional design shall detail the requirement for this type of camera.

Where applicable for Busway Infrastructure, Fixed Mega Pixel cameras may be used for coverage of station entrances/exits, stairways and lifts, or in other station circulation areas where permitted by the department’s Project Representative. This will occur only where PTZ functionality does not provide any further significant benefit. The Mega Pixel requirement shall meet the Resolution 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. Proprietary compression codecs shall not be used. Captured video feeds/images must be transmitted to the Principal's TMC, and other sites as specified in the Contract.

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

Digital imaging technology shall be used throughout the entire image data chain, including the camera and displays. However, the imaging equipment, and images shall be fully compatible and interoperable with the imaging display and control systems being utilised by the Principal, 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 DVTel Latitude. The contractor shall confirm the version of DVTel 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 TMR project representative) shall be compatible with the department’s current imaging and control system, DVTel Latitude. Where new cameras are being installed, the use of a separate encoder will not be accepted.

Information on the current devices that are compatible with DVTel can be found via: http://www.dvtel.com/UserFiles/File/Latitude-6.3-CP1-Supported-Edge-Devices.pdf or www.dvtel.com.

In addition, 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 slow scan as determined by the communication system used at each camera site, the ITS functional design and an IP network capacity 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 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 25fps.

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 is supported by an approved departmental communications service such as ADSL2+, 3G HSDPA/HSUPA, 4G, GWIP or proprietary privately established wireless links.

Where reduced bandwidth conditions occur due to failure and/or degradation of the normal (primary) image transmission channel, the image quality shall automatically throttle back to retain maximum
image quality as allowed by the reduced channel bandwidth. The absolute minimum image quality parameters acceptable over a reduced bandwidth and/or secondary transmission channel shall be least four frames per second at SVGA 800 x 600 pixel resolution (minimum) using the full dynamic ranges of the camera.

Upon resumption of normal (primary) transmission channel bandwidth, the image quality shall automatically return to normal image quality.

6.3 **PTZ CCTV applications - roadway**

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.

6.4 **PTZ CCTV applications – busway**

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.

6.5 **CCTV control system**

The latency of commands issued by the operator in the Principal’s TMC must be less than 200 msec. This applies to the following components:

a) DVTel Latitude ControlCentre Client Software

b) DVTel Latitude AdminCentre Client Software

c) DVTel Media Archiver

d) DVTel Web Client, and

e) DVTel Directory Server.
7 Design requirements

7.1 General CCTV system Ethernet communications architecture

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

```
+-----------------+          +-----------------+
| Mega Pixel      |          | PoE Injector    |
| Camera          |          |                 |
+-----------------+          +-----------------+
| PTZ IP Dome     |          |                 |
| Camera          |          |                 |
+-----------------+          +-----------------+
| Fixed IP Camera |          |                 |
+-----------------+          +-----------------+
| Dedicated       |          | Separate Power  |
| PT(Z) unit      |          | (if required)   |
+-----------------+          +-----------------+

```

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 the below table (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>
<thead>
<tr>
<th>Area of Operation</th>
<th>Busway PSSEM Priority 1 (Data Storage – 7d)</th>
<th>Busway PSSEM Priority 2 (Data Storage – 15d)</th>
<th>Busway PSSEM Priority 3 (Data Storage – 30d)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Public Access areas</td>
<td>Public entry/exit at strategic points. For example access pathways/steps to platforms.</td>
<td>Identify</td>
<td>Identify</td>
</tr>
<tr>
<td>Help Points</td>
<td>Identify</td>
<td>Observe</td>
<td></td>
</tr>
<tr>
<td>Car Parks</td>
<td>Entry/exit points (Vehicles)</td>
<td>Observe</td>
<td></td>
</tr>
</tbody>
</table>

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 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 Ethernet network.

The DVTel 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 & HTTPS protocol for image retrieval.

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

j) Supports the ability to disable unused device network services e.g. insecure management protocols such as telnet, HTTP, etc.

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

l) The department’s project representative is to engage the respective District ITS Administrator for imaging equipment IP address allocation and necessary network configuration.

7.5 Video storage

Understanding the impact of additional CCTV video recording traffic has on the existing ITS Ethernet network is important as insufficient capacity has the potential to lead to poor reliability and ultimately impact TMC operational objectives. One analogy is the limited size of a pipe (Ethernet Bandwidth capacity) and water (the Ethernet Traffic or Services) travelling through it.

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 particular 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 TMR Project representative) which may include the following options:

a) additional DVTel Media Archiver unit; and

b) RAID 5 (e.g. single drive redundancy), RAID 6 (e.g. 2 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 DVTel 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 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 @ 0.05 lux
h) power supply – IEE802.3af (PoE).
i) the camera operating environment shall be -10 to 50 degrees C temperature with 0-90% non-condensing humidity, and  
j) supports secure mechanism for the periodic transfer of images to an IP server source.

8.2 Mega Pixel 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 52dB
e) SNR of 45dB
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, 2MP, 1.3MP, HDTV720P, XGA, SVGA, PAL, NTSC, VGA, CIF, SIF
k) the camera operating environment shall be -10 to 50 degrees C temperature with 0-90% non-condensing humidity.

8.3 Camera housing

8.3.1 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.

8.3.2 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 degrees Celsius.
d) Internal free space must be provided such that the camera, lens and cables do not interfere with the housing itself. The housing must accept camera and lens combinations (including BNC connector) up to 728 mm W x 768 mm H x 3302 mm L (assuming a fully extended lens), and
e) The camera housing window must not introduce any distortion to the video picture.
8.4 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 F1.2 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%.

8.5 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, DVTel. (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.

8.6 PTZ 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 degrees C temperature with 0-90% non-condensing humidity, and

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

o) the camera shall have the configuration ability to increase the horizontal viewing angle by up to 5 degrees

p) 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.

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.

8.7 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
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, and

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

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 S-005 and MRTS61 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 Clause 6.3.2 (Wind loading) and Clause 6.3.5 (Deflection) of S005 and vibration not impairing the imaging equipment performance. Where cameras are mounted at such a height, the camera shall be 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, 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

Weatherproof ITS field cabinets shall be supplied for each camera site to house the camera control, video transmission equipment and power supply. The field cabinets shall comply with the requirements of Clause 13 of MRTS201. The departmental representative shall be consulted as to the current list of type approved ITS field cabinets in existence. A suitable cabinet shall be selected from this list.

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) camera 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) encoder (where approved by the department’s project representative) shall have the latest firmware revision, and

d) 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 Specification.
10 Electrical requirements

10.1 General

Mains power to the field cabinets shall comply with the requirements of MRTS210. Any design shall be electrically certified by a Registered Professional Engineer of Queensland (RPEQ). All electrical wiring and associated equipment shall comply with the requirements of AS/NZS 3000 Wiring Rules.

10.2 Mains power supply

The mains power supply shall be designed to meet the requirements of each individual field site and as shown in the relevant design drawings. The ITS cabinet where the cameras are powered from shall source incoming LV power from the nearest point of supply (POS).

Should none exist, a Form 2 shall be submitted to the relevant energy supply authority for a new connection to be arranged. (e.g. from a Green Energy Pillar or pole mounted single phase LV transformer).

Where the new installation draws supply from an existing departmental switchboard, the contractor shall be responsible for updating the load agreement with the relevant energy supplier.

Should there be no single phase LV power source available, the use of a photovoltaic (PV) based power source shall be considered. (i.e. remote locations where any LV power supply is not available or the cost prohibitive). Any such PV based power source design shall be certified by an electrical RPEQ.

10.3 Protection device

In the absence of any other departmental standard electrical requirements, the electrical circuit design shall comply with AS 3000 and ensure that the circuit protection device such as a Miniature Circuit Breaker (MCB) is suitably selected for the designed attached loads and Earth Fault Loop Impedance (EFLI). A safety switch or Residual Safety Device (RCD) shall also be installed to disconnect the circuit immediately when there is an imbalance of incoming and outgoing circuit current by 30 mA.

10.4 Camera power source

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

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

b) 12 Vdc +/- 5%

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

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.

Existing switchboards shall not be used as a source of power (during construction or operation) unless the local electricity supply authority has been advised of the changes in connected load in accordance with this Specification, and has authorised the use of such loads.

For sites with multiple cameras, the electrical design shall ensure that the voltage at the furthest camera from the power supply does not fall below the minimum required of the connected camera.
Any camera power supply shall be rated to accommodate the combined power consumption of the connected cameras.

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.

10.5 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 provisioned for and complies with following requirements:

a) is suitably sized to provide backup power to up to 4hrs for the loads associated with the connected camera infrastructure

b) where cameras are located within a tunnel or tunnel egress, the tunnel essential services power supply shall be utilised to provide the backup power

c) UPS shall comply with AS 62040

d) the UPS battery components shall be adequately ventilated, and

e) appropriate short circuit protection and RCD shall be selected according to specific UPS operational and fault characteristics.

The contractor shall confirm the requirement for UPS backing with the department’s project representative prior to commencing the design.

10.6 Surge protection

Each imaging installation (power, data and video cables; camera; lens and housing assembly) shall be protected from damage from transients from mains power supply and/or induced by lightning strikes and shall comply with the requirements of AS/NZS 1768 and AS 4262. Surge protection devices shall comply with AS/NZS 4117.

10.7 Electrical testing

The mains power supply shall be tested in accordance with the Electrical Legislation and Wiring Rules. A currently licensed electrical contractor shall conduct electrical tests and submit an electrical test certificate to the department’s project representative, prior to energisation of any power circuits.

11 Telecommunication requirements

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

All telecommunications equipment shall comply with relevant Australian Communications & 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 3085.1.

11.2.1 **Permanent**

The Contractor shall contact the department’s project representative should there be a requirement to arrange for a permanent 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 permanent 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 date of the permanent service. The contractor shall pay any setup costs for the permanent service.

11.2.2 **Temporary**

The Contractor shall contact the department’s project representative should there be a requirement to arrange for a temporary 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 temporary 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 date of the temporary service. The contractor shall pay any setup costs for the temporary 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) Underground rated CAT5/5E cabling terminated with EIA/TIA568 RJ45 connectors.

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

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

g) 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.

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

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

j) 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 4

TMR 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 regards 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 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 DVTel video system)

c) configuring DVTel 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)
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:

b) 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 5**

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:

i. electrical tests

ii. equipment and/or system operation, and

iii. 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.

Where the manufacturer of test equipment indicates that the test equipment can be calibrated, the test equipment must be calibrated by a certified NATA laboratory. The certificate of calibration must be current at the time(s) of the test(s). A copy of the relevant certificate(s) of calibration must be included in the operations manuals.

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)
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.
13.4 **DVTel 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 DVTel 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.

All new necessary licences for any additional cameras, directory servers, failovers shall be supplied to the department’s project representative for submission to the relevant District ITS Administrator.

*Hold Point 6*

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 7*

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 be used.

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 8*

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:

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

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

15 Training requirements

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

16 Maintenance requirements

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

The handover requirements defined in MRTS201 General Equipment Requirements apply to this 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 10
# Appendix A – Generic CCTV Commissioning Test (CT) Sheets

## CT: COMMISSIONING REPORT SHEET

### CLOSED CIRCUIT TV CAMERA

<table>
<thead>
<tr>
<th>Form No: CCTV-CT-CRS</th>
<th>Rev3.0</th>
</tr>
</thead>
</table>

### 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: |
| 1.4 | DVTel Camera License: |
| 1.5 | As Constructed Dwg Details: No. Rev: |
| 1.6 | Location Description / Address: |
| 1.7 | GPS Co-ordinates (WGS84 format): |
| 1.8 | CCTV Installation Type: Swing Pole Height: 8m 10m 12m 15m ___m |
| 1.9 | IP CCTV Type: |
| 1.10 | Camera Power Type: |
| 1.11 | Camera IP Details: |
| 1.12 | Connected Ethernet Switch Details: |
| 1.13 | PTZ Details: |
| 1.14 | TMC Commissioning Reference No.: |

### 1.1 CCTV Installation Type:
- Pole Top
- Building
- Ceiling

### 1.2 IP CCTV Type:
- PTZ: Integrated
- FIXED:
  - Dome
  - Web
  - Mega Pixel

### 1.3 Camera Power Type:
- PoE: IEEE802.3af (15.4W) IEEE802.3at (30W)
- p/s: 12Vdc 24Vac

## Specifications and Technical Standards, Transport and Main Roads, October 2014

30
### 2.0 PRE-CHECKS PRIOR TO COMMISSIONING

<table>
<thead>
<tr>
<th>Test Step</th>
<th>Expected Condition/ Result</th>
<th>Pass / Fail / NA</th>
<th>Signed</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.1 Check that an IAT has been performed for each Camera and labels fitted</td>
<td>IAT available on site at time of commissioning.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.2 As Constructed Drawing</td>
<td>Verify the installation matches the As Constructed drawing</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.3 Check Traffic Management Centre connectivity available</td>
<td>All switches on sites are on at the time of testing</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.4 Check DVTel programming</td>
<td>CCTV is identified correctly on the DVTel Tree and in the right location.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.5 DVTel Presets</td>
<td>Presets have been programmed into DVTel system.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.6 Surge Protection</td>
<td>Surge protection present in both the cabinet and at the camera.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.7 Camera Pole Cable Support System</td>
<td>Cables installed in poles are supported vertically by appropriate cable support and there is no evident damage to cable insulation at pole penetrations.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### 3.0 Functional Testing from Network Video Management System (DVTel)

<table>
<thead>
<tr>
<th>Test Step</th>
<th>Expected Condition/ Result</th>
<th>Pass / Fail / NA</th>
<th>Signed</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.1 Pan</td>
<td>360 Degree panning</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.2 Tilt</td>
<td>+10 to -90 Degree from horizontal</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.3 Focus</td>
<td>1.2m to Infinity</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.4 Zoom</td>
<td>Minimum to Maximum Zoom of an object and ensure focus tracking</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.5 Day Contrast</td>
<td>Detail in observed image is acceptable to TMC operator</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.6 Night Contrast</td>
<td>Detail in observed image is acceptable to TMC operator (confirms CCTV camera is back focused)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.7 Pre-set PTZ</td>
<td>CCTV camera consistently rotates to a pre-set PTZ command</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.8 PTZ performance</td>
<td>A full PTZ from one extreme to the other is performed to check circuit breaker does not trip.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.9 Check comms auto recovery</td>
<td>Disconnect Ethernet comms from switch and check camera auto reconnects with DVTel</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.10 Check power auto recovery</td>
<td>Power cycle camera and check auto reconnects with DVTel</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Switch main circuit breaker, PoE device, Power supply or connected Ethernet Switch and check auto reconnects with DVTel (if applicable)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CT ref.</td>
<td>Defect Description</td>
<td>Rectification Required by</td>
<td>Date Fixed</td>
</tr>
<tr>
<td>--------</td>
<td>-------------------</td>
<td>---------------------------</td>
<td>------------</td>
</tr>
<tr>
<td>a.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>b.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>c.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>d.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>e.</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**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…………………………