

Roads

Master Specification

RD-ITS-S5 Imaging Equipment

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RD-ITS-S5 Imaging Equipment

1 General

- 1.1 This Part specifies the requirements for the supply of imaging Equipment associated with the Traffic Management Systems. It also specifies installation requirements for Contracts that include installation of the Equipment
- 1.2 This Part does not apply to:
- a) Vide-based Traffic Signal vehicle or pedestrian detection systems used in lieu of other vehicle detection loops or pedestrian detectors and that only supply a detection input to a Traffic Signal Controller; or
 - b) Imaging equipment associated with Automatic Number Plate Recognition (ANPR) systems used for law enforcement purposes.
- 1.3 This Part shall be read in conjunction with the following Parts:
- a) RD-ITS-D1 Design for Intelligent Transport System (ITS).
 - b) RD-ITS-S1 General Requirements for the Supply of ITS Equipment.
 - c) RD-ITS-S3 ITS Enclosures.
 - d) RD-ITS-C1 Installation and Integration of ITS Equipment.
 - e) RD-ITS-C2 Mains Power for Traffic management Equipment.
 - f) RD-ITS-C3 Telecommunication Cabling.
 - g) PC-QA1 Quality Management Requirements.
- 1.4 Documents referenced in this Part are listed below:
- a) AS/NZS 1170 Structural Design Actions.
 - b) AS/NZS 3000 Electrical installations (known as the Australian/New Zealand Wiring Rules).
 - c) AS/NZS 3085.1 Telecommunications Installations – Administration of Communications Cabling Systems – Basic Requirements.
 - d) AS 4806.1 Close-Circuit Television (CCTV) – Management and Operation.
 - e) AS/NZS ISO 9001 Quality Management Systems – Requirements.
 - f) AS/CA S009 Installation of Telecommunications Customer Cabling (Wiring Rules).
 - g) Office of the Australian Information Commissioner – Guide to Undertaking Privacy Impact Assessments.
 - h) Office of the Australian Information Commissioner – 10 Steps to Undertaking a Privacy Impact Assessment (PIA).
 - i) A National Approach to Closed Circuit Television – National Code of Practice for CCTV Systems for the Mass Passenger Transport Sector for Counter-Terrorism (Infrastructure Australia).
- 1.5 Equipment supplied under this Contract shall comply with applicable Australian Standards, or where no appropriate Australian Standard exists, the Equipment shall comply with the appropriate British Standard.
- 1.6 The telecommunications equipment shall comply with relevant Australian Communications and Media Authority (ACMA) technical standards and requirements. Equipment requiring connection to telephone lines shall be ACMA approved and be labelled with the appropriate approval number.
- 1.7 The following definitions apply within this Part:

Normal	Normal
Electrical Legislation	The Electricity Act 1994 and associated Amendments and Regulations and Electrical Safety Act 2002 and associated Amendments, Regulations and Codes of Practice.
Image Quality	Parameters of image information, such as resolution, colour, contrast, and image refresh rate.
Imaging Equipment	The 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.
ONVIF	Open Network Video Interchange Forum. An industry forum that has agreed on a set of global, open standards for interoperability between IP-based physical security products.
PIA	Privacy Impact Assessment. A process of assessing the impact of a project on individual's privacy and making recommendations for managing, minimising or eliminating privacy impacts.
TMC	Traffic Management Centre (Norwood unless stated otherwise)

2 Quality Requirements

- 2.1 All supplied equipment shall be manufactured under a quality system certified to AS/NZS ISO 9001.
- 2.2 The Contractor shall prepare and implement a Quality Plan, in accordance with PC-QA1 "Quality Management Requirements" that includes or annexes the following documentation:
- design documentation in accordance with RD-ITS-D1 "Design For Intelligent Transport System (ITS)";
 - Acceptance Test Plans (refer RD-ITS-S1 "General Requirement for the Supply of ITS Equipment", Clause 13 "Testing and Acceptance"), which provides full details of all tests necessary;
 - routine maintenance recommendations;
 - Training Plan (refer RD-ITS-S1 "General Requirements for the Supply of ITS Equipment", Clause 15 "Training");
 - spare part requirements;
 - manufacturer's specifications (catalogue extracts) of all major components detailing ratings and performance characteristics; and
 - all layout, fabrication, interconnection and assembly drawings and diagrams necessary.
- 2.3 The Contractor shall supply evidence of compatibility with DPTI's video management systems in place at the time the Contract was awarded.
- 2.4 The Contractor shall provide samples for acceptance in accordance with RD-ITS-S1 "General Requirements for the Supply of ITS Equipment", Clause 3 "Equipment Requirements".
- 2.5 If not submitted beforehand, the samples and documentation required by this Clause shall be submitted at least 20 working days prior to the commencement of site work or placing an order for Equipment.
- 2.6 Where the Contractor is responsible for determining any location, layout or site selection for any of the Equipment, the Contractor shall provide fully detailed location / layout documentation. Where appropriate, the documentation shall show general layout, reduced levels, Equipment position, coordinates or offsets, speed zones, conduit and pit locations, mounting structure positions and any protective barriers. All nearby Private Property boundaries shall be included in the documentation to allow determination of the need for a Privacy Impact Assessment (PIA).
- 2.7 If appropriate, details of Equipment brackets and support connections shall also be provided. Any drawings provided pursuant to this clause shall be prepared in accordance with the Principal's drafting standards and guidelines, available from <https://www.dpti.sa.gov.au/standards>.

- 2.8 If not submitted beforehand, the documentation required by this Clause shall be submitted at least 28 days prior to the commencement of site work.
- 2.9 Provision of the documentation and samples listed in this Clause shall constitute a **Hold Point**.

3 Equipment Requirements

Colour Cameras

- 3.1 DPTI's video systems are Internet Protocol (IP) based using multicast networked video transmission. Preference shall be given to cameras that integrate natively with DPTI's video management systems at the time of the Contract. Cameras from different vendors shall be compliant with ONVIF Profile S and shall be able to be integrated into DPTI's existing IP video network, providing at least equivalent functionality to DPTI's existing camera platforms. The integration is the responsibility of the Contractor.
- 3.2 The cameras shall use progressive scan image sensors capable of at least 2 megapixel resolution (1920 x 1080 pixels) and a horizontal resolution >800 TV Lines.
- 3.3 The camera shall be capable of streaming video at a digital resolution of 190 x 1080 pixels non-interlaced (1080p) at 30 frames per second. The cameras shall be capable of simultaneously streaming multiple streams at different resolutions and frame rates.
- 3.4 Cameras shall generally provide automatic day / night mode switching, using a mechanical infra-red (IR) cut filter, with a minimum daytime mode sensitivity of 0.05 Lux and a minimum night-time sensitivity of 0.005 Lux (monochrome) at 30IRE, F1.2, shutter speed 1/15s.
- 3.5 Cameras for use on motorways or unlit roads shall include adaptive infra-red illumination capable of providing calibrated IR illumination up to a distance of 200m and shall have a minimum night-time sensitivity of 0.0005 Lux (monochrome at 30IRE, F1.5, shutter speed 1/30s).
- 3.6 PTZ cameras shall be of the integrated "dome" type suitable for outdoor installation. They shall be capable of 360° continuous rotation (panning) and have a horizontal tilt range of at least 100° (10° above the horizontal to vertically downwards).
- 3.7 PTZ cameras shall be capable of a video overlay indicating the compass direction that the camera is facing at any given time.
- 3.8 Camera domes shall be treated with an "anti-rain" formulation to prevent rain droplets from beading on the dome or housing viewport and obstructing the camera vision.
- 3.9 Mains Power shall be supplied in accordance with RD-ITS-C2 "Mains Power for Traffic Management Equipment". The Contractor shall provide hardwired step-down power supplies for the imaging Equipment. Wherever equipment provides for the use of redundant power supplies they shall be installed and used.
- 3.10 Power over Ethernet (PoE) equipment may be used, provided it is compliant with 802.3af or 802.3at (or their successors, as may be current at the time of provision of the imaging equipment). PoE sources (e.g. mid-span power injectors, PoE switches or media converters) providing power to the PoE equipment shall be compliant with the same standards as the equipment being powered.
- 3.11 Non-PoE cameras shall be supplied by a suitably rated ELV supply. A circuit breaker shall be supplied on the mains input to the power supply, and on the power supply output to each camera ("B" curve circuit breakers are preferred for the ELV side). Circuit breakers and cable sizes shall be calculated in accordance with AS 3000 Wiring Rules, taking into account device start-up ("in-rush") current.
- 3.12 Where possible, cameras shall be supplied from individual power supplies. Designs incorporating common power supplies for multiple cameras require prior approval from the Principal.
- 3.13 Provision of the design shall constitute a **Hold Point**.
- 3.14 The camera's network interface shall be IEEE 802.3 standard Ethernet, capable of at least 100 Mb/s (i.e. 10/100 Base TX). Unless otherwise approved by the Principal, cameras shall comply with the ONVIF Network Interface Specification Set, v2.6 or higher.

- 3.15 The DPTI Approved Products list will provide guidance to the Contractor regarding equipment that is acceptable to DPTI. If the Contractor chooses to propose alternative equipment that is not on the Approved Products list, the Contractor shall demonstrate that the alternative equipment meets the specified requirements. Acceptance of proposed alternatives shall be at the discretion of the Principal.
- 3.16 Provision of the proposed list shall constitute a **Hold Point**.

Video Incident Detection System (VIDS) / Thermal Incident Detection System (TIDS) Camera

- 3.17 Incident detection cameras shall be capable of operating within the Principal's existing video incident detection systems at time of supply. Preference shall be given to cameras using thermal imaging technologies.
- 3.18 The number and locations of incident detection cameras shall be chosen to provide 100% coverage of the specified areas of the project with sufficient overlap that loss of a single camera does not cause a failure to detect incidents.
- 3.19 The system shall be capable of detecting at least the following:
- stopped vehicles;
 - contra-flow vehicles;
 - pedestrians; and
 - fallen / dropped objects.
- 3.20 With the possible exception of fallen objects, detection of each of the above incidents types shall be possible over the full viewing range of the camera.
- 3.21 Incident Detection cameras installed in tunnels shall also be capable of detecting smoke and / or fire.
- 3.22 Configuration and integration of the Incident Detection cameras into DPTI's Video Incident Detection systems shall be done by the system's manufacturer, or their authorised and appropriately qualified representative.
- 3.23 TCP/IP Incident Detection Cameras shall also be ONVIF compliant and capable of integration with DPTI's existing video management software and recording solutions. If cameras that have only analogue video outputs are chosen, IP video encoders that are compatible with DPTI's video management system shall be used to encode the video from the cameras to allow them to be integrated into DPTI's existing video systems.

CCTV and VIDS / TIDS Camera Mounting Arrangements

- 3.24 Dedicated camera poles shall be a hinged type column designed for CCTV, of appropriate height and stability to provide clear and stable pictures under all expected (normal) local weather conditions. The pole shall be of galvanized welded steel construction, tapered with a round or polygonal section of smooth appearance. The pole shall be base plate mounted and be suitable for mounting on a rag bolt assembly in a concrete footing or equivalent. If the pole is of a height that a standard column is not available, the pole shall be designed in accordance with RD-ITS-C1 "Installation and Integration of ITS Equipment", Clause 9 "Design of Support Structures" and AS/NZS 1170 "Structural Design Actions".
- 3.25 All PTZ cameras shall be installed so that the camera horizon is horizontal, as measured with a spirit level or suitable equivalent means. Camera installations with tilted horizons will not be accepted.
- 3.26 Hinged camera poles shall be secured by the use of DPTI-supplied padlocks and barrier bolts that cannot be removed without specific tools.
- 3.27 Testing the tilt operation of all hinged poles shall be the responsibility of the Contractor and shall be incorporated into the CCTV Test and Commissioning Plan. The Contractor shall demonstrate that the pole can be safely lowered to its full extent without conflicts with any pole-mounted or nearby roadside cabinets, other infrastructure, landscaping or vegetation. Any such conflicts shall be resolved prior to the acceptance by DPTI.

- 3.28 Sufficient clear, all-weather walking area shall be provided and maintained either side of the pole, to a length at least equal to 1.5 times the height of the pole, in the plane of the lowering action, to allow the pole to be safely lowered.
- 3.29 Where cameras are mounted on other structures (e.g. gantries, tunnel infrastructure, shared use poles) the same stability requirements apply.
- 3.30 Mounts for Incident Detection cameras shall meet or exceed the requirements specified by the Incident Detection System manufacturer (including but not limited to resistance to vibration / maximum deflection).

Field Cabinets

- 3.31 With the exception of cable terminations and lighting suppression devices, no camera-related equipment shall be mounted inside poles or other support structures.
- 3.32 Where cameras and ITS roadside cabinets can be co-located, it is preferred that the cameras are supplied their power and network connection from the nearest roadside ITS cabinet ("outstation").
- 3.33 Where they are not co-located, weatherproof field cabinets shall be supplied for each camera site to house the power supply and network access points (Ethernet switches). The field cabinets shall comply with the relevant sections of RD-ITS-S3 "ITS Enclosures" to ensure fitness for purpose. Cabinets shall be mounted to suitable brackets welded to the camera column. If this is not possible, cabinets may be free-standing. Pole mounted cabinets shall be mounted in such a way that:
 - a) the tilt operation of the pole is not compromised;
 - b) there is no fouling between the cabinet and any part of the pole or camera when lowering or lowered;
 - c) access to the cabinet is not obstructed in any way when the pole is lowered; and
 - d) the cabinet shall have safe, all-weather access for maintenance personnel.
- 3.34 For cameras at Traffic Signal sites mounted on shared traffic signal infrastructure, the camera shall be supplied their power and network connections from the traffic signal controller extension housing.
- 3.35 The length of network cabling between the designated network point and the camera shall not exceed the maximum permissible length for an Ethernet Segment (97 m).
- 3.36 If a longer run is required, single mode optical fibre shall be used for the connection to the network.

Camera Controls

- 3.37 Close Circuit Television (CCTV) cameras shall have control facilities for pan, tilt, zoom, focus and saving / recalling pre-set positions that are compatible with the CCTV control system in the TMC that is current at the time of the provision of the CCTV camera.

Lightning / Surge Protection

- 3.38 A lightning risk assessment as specified in AS/NZS 1768 shall be carried out for each camera installation. Each camera installation that shows appreciable risk of damage by lightning, whether to the camera, associated or nearby equipment or personnel, shall incorporate a lightning protection system that will control lightning surge energy on all cables (power, video, PTZ data and Ethernet as applicable) before it enters the associated equipment cabinet or building.
- 3.39 For cameras mounted on stand-alone support structures (e.g. poles, gantries, etc.) the lightning protection systems shall be grounded to the camera support structure which, in turn, shall be grounded properly designed lightning earth system. Cameras mounted on buildings shall be considered in the overall building lightning protection design according to AS/NZS 1768.
- 3.40 Secondary surge protection shall be installed as close as practicable to the cable entry point into the cabinet and bonded to the cabinet structure. Equipotential bonding between the lightning protection system and the electrical service earth shall be in accordance with AS/NZS 1768 section 5.

4 Operation Requirements

Functional Requirements

- 4.1 The imaging equipment shall be used as part of an overall Traffic Management System (TMS). In accordance with the project specific requirements, the imaging Equipment shall allow TMC staff to:
- detect, verify and manage incidents and congestion;
 - monitor and control the imaging Equipment from the TMC, and / or other nominated location(s);
 - monitor pedestrian and / or cycleway activities; and
 - monitor operation and ensure security of DPTI infrastructure.

Performance and Configuration Requirements

General

- 4.2 Images shall be captured, transmitted and displayed at the highest quality and refresh rate possible.
- 4.3 End-to-end image compression / decompression shall retain the maximum image quality to ensure that the functional requirements are met. The image quality and resolution displayed at the TMC shall satisfy the identification requirements as specified below:

Image Data Rate

- 4.4 Where the image will be transmitted entirely by fibre, the transmitted image shall be refreshed with at least 25 frames per second at maximum camera resolution over the dynamic ranges of the camera. Where the image will be transmitted other than entirely by fibre, the transmitted image shall be refreshed with at least eight (8) frames per second at minimum 352 x 288 pixel resolution (1CIF) over the full dynamic ranges of the camera.

Pedestrian Identification

- 4.5 Cameras installed for the purpose of monitoring pedestrian traffic (e.g. site security cameras, cameras in tunnel egress, or service corridors) shall be configured to meet at least the "recognise" operational objective as defined in the National Code of Practice for CCTV Systems para 4.1.2. Cameras covering entrance / exit points shall be configured to meet the "identify" operational objective (ibid).

Vehicle Applications

- 4.6 Cameras installed at intersections or on motorways shall be capable of positively identifying an individual vehicle and observing pedestrian activity at the full optical zoom range.

CCTV Control System Latency

- 4.7 The effect of commands issued by the operator in the TMC shall be observed by the operator within 200 msec.

5 Recording and Footage Retention

- 5.1 Video from all cameras shall be recorded on Network Video Recorders (NVRs) compatible with DPTI's video management systems current at time of this Contract. Footage shall be able to be retrieved from any DPTI primary, backup or subsidiary control centre with DPTI's existing video management software. NVRs shall include remote lights-out hardware management capability (e.g. Dell's iDrac Enterprise or similar). The Contractor shall demonstrate that the proposed NVR solution is compatible with DPTI systems and all cameras being supplied under this Contract.
- 5.2 This shall constitute a **Hold Point**.

NVR Storage Capacity

- 5.3 NVR storage shall be based on RAID technology. RAID10 is preferred for performance reasons if a large number of streams are being recorded.
- 5.4 The required storage size shall be calculated based on recording all required camera streams at their maximum available resolution and frame rate and retaining footage for not less than 31 days, in accordance with AS 4806.1 (para. 8.3), plus an allowance of at least 25% additional storage for future growth / expansion.
- 5.5 The Contractor shall calculate the required storage and provide the results of these calculations to the Principal for review at least 10 working days before ordering equipment.
- 5.6 Provision of the storage calculations shall constitute a **Hold Point**.

Redundancy and Load Sharing

- 5.7 At least two NVRs for each location shall be provided, configured for automatic failover. Each video recorder shall meet the storage requirements in Section “NVR Storage Capacity” above and be capable of recording all required camera streams. Each NVR shall be configured to normally record half of the required camera streams and to act as a redundant failover recorder for its partner.

Monitoring and Fault Reporting

- 5.8 NVRs shall be capable of remote monitoring via SNMP v2c or V3 (preferred). The required MIBs shall be supplied by the Contractor for integration into DPTI’s SNMP monitoring system(s).
- 5.9 NVRs shall automatically report alarms and faults via automatically generated email alerts to at least one configured email address, and / or via SNMP traps.

ONVIF Compliance

- 5.10 NVRs shall be ONVIF compliant and capable of recording all cameras supplied under this Contract.

6 Privacy Considerations

- 6.1 The Contractor shall determine whether the proposed camera locations warrant carrying out a PIA. As a guide, where cameras are suited near property boundaries, such that they are likely to be able to see into private property, a PIA will be required.
- 6.2 PIAs shall be carried out in accordance with the guidelines published in the “Guide to Undertaking Privacy Impact Assessments” (available from <http://www.oaic.gov.au/images/privacy/privacy-resources/privacy-guides/guide-to-undertaking-pias.pdf>).
- 6.3 A second document, entitled “10 Steps to Undertaking a Privacy Impact Assessment”, provides a summary of the process to be followed. This is available at <http://www.oaic.gov.au/images/documents/privacy/privacy-resources/privacy-guides/summary-pia-guide.pdf>.
- 6.4 To prevent breaches of privacy, views into private residential properties shall be obscured. This may be achieved using electronic means (e.g. “privacy zones” configurable in the cameras) or by physical barriers. Whichever method is chosen, they shall be configured and / or installed in a manner which does not impact on the operability of the cameras for the purposes for which they are installed.
- 6.5 The PIA report, or the determination that a PIA is not needed, shall be provided to the Principal for review. A copy shall be included in the As-Built documentation.
- 6.6 Provision of the report shall constitute a **Hold Point**.
- 6.7 Information about proposed camera locations and the methods employed to protect privacy shall be included in any community consultation processes that are undertaken as part of the project.

7 Network and Telecommunications Requirements

Network Bandwidth

- 7.1 If construction or expansion of an ITS network forms part of this Contract, the Contractor shall calculate the network bandwidth required for transmission of all video streams at their maximum resolution and frame rate, plus all other expected network traffic, plus an allowance of at least 25% for future growth / expansion. The Contractor shall liaise with the network designers to ensure that these bandwidth calculations are taken into account in the overall network design. The Contractor shall provide the calculations to the Principal at least 10 working days prior to the completion of the network design.
- 7.2 Provision of these calculations shall constitute a **Hold Point**.

Telecommunications Lines

- 7.3 If telecommunications lines are required under this Contract they shall be provided and installed in accordance with the requirements of AS/CA S009 and AS 3085.1.
- 7.4 Telecommunication cables shall comply with RD-ITS-C3 “Telecommunications Cabling”.

8 Hold Points

- 8.1 The following is a summary of Hold Points referenced in this Part:

Document Ref.	Hold Point	Response Time
2.9	Quality Plan	5 Working Days
2.9	Samples for acceptance	5 Working Days
2.9	Evidence of compatibility	5 Working Days
3.13	Approval for design using common supply for multiple cameras	5 Working Days
3.16	Approval for proposed alternative equipment not on approved equipment list.	10 Working Days
5.2	Demonstration that the proposed NVR solution is compatible with DPTI systems	5 Working Days
5.6	Provision of NVR storage requirement calculations	5 Working Days
6.6	Provision of PIA determination and / or report	5 Working Days
7.2	Provision of CCTV-related network bandwidth calculations	5 Working Days

9 Verification Requirements and Records

- 9.1 The Contractor shall supply the following records:

Table RD-ITS-S5 9-1 Verification Requirements

Document Ref.	Cause and Subject	Record to be Provided
RD-ITS-S1	11 “Equipment Manuals”	Operation and maintenance manual(s)
RD-ITS-S1	12 “Warranty”	Manufacturer’s Warranty
RD-ITS-S1	14 “As-Built Documentation”	As-Built documentation
RD-ITS-C1	8 “Testing & Commissioning”	Test Records - refer RD-ITS-C1 “Installation and Integration of ITS Equipment”.