Technical Specification

Transport and Main Roads Specifications MRTS250 Provision of Automatic Number Plate Recognition System

July 2017

Queensland Government

Copyright

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

Contents

1 Introduction

This Technical Specification defines the design, supply, installation, testing and commissioning, performance, documentation, training and maintenance requirements for field infrastructure, devices and software that form part of an automatic number plate recognition (ANPR) system.

The ANPR system is used to monitor vehicle traffic at key points of the road network. Information gathered is analysed off-line by the Principal and / or others to develop origin / destination data and travel time statistics.

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

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

2 Definition of terms

The terms defined in Clause 2 of MRTS01 *Introduction to Technical Specifications* and MRTS201 *General Equipment Requirements* apply to this Technical Specification. Additional terminology relevant under this Technical Specification are defined in Table 2.

Table 2 – Definitions

Term	Definition
ANPR	Automatic Number Plate Recognition
FTP	File Transfer Protocol
IR	Infra-Red
NTP	Network Time Protocol
HTTPS	Hyper Text Transfer Protocol Secure
OCR	Optical Character Recognition
Principal's Telecommunications Network	Telecommunications network owned by the Principal, that complies with MRTS245

3 Reference documents

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

Table 3 – Referenced documents

Reference	Title
IEC60825-1 (1993)	*Safety Standard for Lasers*
MRTS78	*Fabrication of Structural Steelwork*
MRTS91	*Conduits & Pits*
MRTS94	*Road Lighting*
MRTS201	*General Equipment Requirements*

4 Quality system requirements

The quality system requirements defined in MRTS201 apply to work under this Technical Specification. There are no additional quality system requirements relevant under this Technical Specification.

5 Functional requirements

The ANPR system shall automatically trigger and capture images of number plates of vehicles travelling at speed, perform OCR and store the textual data. It shall recognise textual data for all variations of number plates, including those of other Australian states, with plates at varying mounting angles and with varying legibility.

Where scene cameras are provided, the ANPR system shall automatically trigger and capture images of the broader vehicle scene.

Data shall be reliable and meet the specified accuracy. Each ANPR site shall allow secure local and remote configuration, status interrogation and data downloads. The ANPR system shall be capable of storing images locally when communications to the Principal's central server is unavailable.

6 Equipment

The ANPR system shall include:

a) digital IR camera and scene illuminator pair in suitable enclosure(s) for each lane

b) image processor(s) (including software)

c) data storage, equipment, and

d) roadside infrastructure including mounting structures, plinths, pits, conduits, cables, telecommunications and the like.

7 Operational requirements

7.1 General

The operational requirements defined in MRTS201 apply to work under this Technical Specification. Additional operational requirements for equipment provided under this Technical Specification are described below.

The ANPR system shall perform with the level of accuracy specified in Clause 7.2.5.1 for traffic speeds ranging from 5 km/h to 130 km/h and in all weather and light conditions.

The ANPR system shall automatically capture images of the front of vehicles travelling in any alignment on the carriageway. The ANPR system shall then automatically crop this image to show predominantly the number plate image. This may require more camera / illuminator pairs than there are trafficable lanes.

7.2 ANPR processor

If an external image processor is required then the unit shall be suitable to be mounted in a standard 19 inch rack in an outdoor field cabinet.

Except for cooling fans, the image processor shall not have any moving parts.

An internal time of day clock shall be provided with an accuracy of 1 minute per year, in 24 hour, Hour-Min-Sec format.

All configuration settings shall be retained in the event of a power failure.

7.2.1 Automatic triggering

The ANPR cameras shall have the ability to be triggered by both hardware and / or software as described below.

7.2.2 Hardware trigger

The hardware trigger shall use a potential-free open / close contact from a vehicle detector (such as an inductive loop detector). The processor shall trigger on both edges of the signal.

One digital input is required for each camera.

7.2.3 Software trigger

The software trigger shall detect a vehicle based on the ANPR video stream. The detection algorithm shall be integral with the ANPR system.

7.2.4 Image data capture

Image data shall be captured using dedicated digital IR cameras.

Each vehicle record shall be a single file and shall contain, as a minimum, an ASCII header that contains the following:

a) vehicle registration number

b) date and time that the vehicle is identified (Time to a resolution of at least two decimal places of a second)

c) OCR confidence level

d) ANPR site location, and

e) identification of ANPR IR camera / illuminator pair / lane.

It shall be possible to include one or more of the following in the same single vehicle record:

a) image of the number plate

b) image of the front of the vehicle from the ANPR IR camera, and/or

c) wide angle vehicle / lane image (with additional scene camera).

A detailed description of the file format shall be provided to allow the Principal to further develop post-processing software.

Software shall be supplied that will export the individual components of the record file to separate files (for example ASCII / JPEG) as appropriate.

Each file name shall indicate the respective capture date, time and vehicle registration number.

Images shall be stored in an industry-standard file format such as JPEG. Each image shall have a digital signature to guarantee file integrity against tampering and shall contain, superimposed as a textual information block, the following data:

a) Date (DD/MM/YYYY)

b) Time in 24 hour format (HH:MM:SS)

c) Location as a configurable fixed string (XXXXXXXX)

The information block shall be white text on a black background. The data shall be spread over two lines; the top line shall display the date and time; the bottom line shall display the site location. The text shall be clearly legible and shall be Courier New font or similar font with a serif, minimum size 8 point. The information block shall be located at the top of the image, so as not to occlude any critical information, and be displayed on all images captured by the ANPR system.

The data storage requirements of each record (with data listed in (a) to (e) above) shall not exceed 5KB. Where one or more images are included, the record size shall be limited to 55KB.

7.2.5 OCR

The ANPR system shall have a high degree of accuracy, as defined below, in all light and weather conditions.

7.2.5.1 OCR accuracy

Where the ANPR imaging equipment is installed above the carriageway, the capture and recognition accuracy shall exceed 90% of vehicles with legally installed number plates.

Where the ANPR imaging equipment is installed on the side of the carriageway, the capture and recognition accuracy shall exceed 80% of vehicles with legally installed number plates.

7.2.5.2 OCR processing

OCR processing shall be automatically conducted, in real time, at the ANPR station in the field. The image processing shall be capable of processing all lanes at a capture rate of 8 vehicles in an 8 second burst, and at least 3000 vehicles per hour per lane.

7.2.6 Data storage device

The output of the OCR process and all captured images shall be stored on an internal solid-state memory storage device housed in the ANPR field cabinet. The memory storage device shall be able to retain a minimum of 15,000 vehicle records per camera.

When the data storage reaches capacity, the image processor shall automatically over-write the oldest data.

7.3 Cameras

Cameras shall not have any moving parts.

Cameras shall have a minimum capture (shutter) speed of 1 ms and capture 50 fields per second to prevent motion blur. The capture (shutter) speed shall be adjusted automatically by the image processor on a field-by-field basis in order to capture the best plate image.

7.4 Illuminators

Illuminator units shall have no moving parts.

Illumination shall be infra-red and non-visible to drivers with a typical wavelength of 60 nm. The light source shall conform to IEC 60825-1.

Illuminators shall have a life span of at least 70,000 hours of continuous, normal operation.

Illuminator operation shall be synchronised with the capture (shutter) operation of the associated plate camera. Illuminator exposure time and intensity shall adjust automatically as a vehicle tracks through the image zone so as to capture the best image.

8 Mechanical and physical requirements

The mechanical and physical requirements defined in MRTS201 apply to work under this Technical Specification. In addition, the enclosure(s) for cameras and illuminators shall provide protection to IP67.

9 Control system

The control system requirements defined in MRTS201 apply to equipment provided under this Technical Specification. Additional control system requirements relevant under this specification are described below.

Remote configuration of the ANPR system and devices, including the setting of the date and time shall be possible. All remote access to the ANPR system shall be via secure connections acceptable to the Principal, such as secure shell Telnet.

It shall be possible to perform all configurations and download tasks locally from a laptop computer running Microsoft Windows® XP-Professional or Windows® 7 Professional. Local connections shall not disrupt remote communications. All specific laptop software to interrogate the ANPR system shall be provided by the Contractor.

Data transfer to a local data storage device shall be via FTP or a similar system acceptable to the Principal. FTP connections shall be via a secure system acceptable to the Principal, such as secure shell FTP.

The ANPR system shall have the ability to upload recorded data automatically to the nominated server immediately after becoming available at the ANPR site.

The processor shall be able to receive software upgrades over both the remote and local communications links.

The ANPR system shall ensure that the local clock is synchronised with an external time piece such as an internet clock using NTP. External applications shall be able to read the ANPR local clock to verify the local clock time.

10 Installation requirements

10.1 General

The installation requirements defined in MRTS201 apply to work under this Technical Specification. Additional installation requirements for equipment provided under this Technical Specification are described below.

10.2 Mounting

The Contractor shall install all ANPR hardware and optimise the aiming of all cameras and illumination units to achieve the greatest accuracy.

Camera and illuminator units shall be mounted above the carriageway using a bracket that allows unlimited aim adjustment and lateral placement. The bracket shall be suitably designed to support the weight of the unit and prevent changes to aiming alignment and lateral placement, including those from wind loading at 150 km/h. The bracket shall be hot dipped galvanised as specified in MRTS78 *Fabrication of Structural Steelwork*.

The camera and illuminator pair shall be located so as to avoid occlusion from traffic in other lanes. It shall be mounted:

a) in the shoulder adjacent the lane in direction of travel (1 lane)

b) in the shoulder and centre median (2 lanes), or

c) above the carriageway (3 or more lanes).

10.3 Cameras

Cameras shall be mounted directly on support structures either located over or beside the carriageway as specified. The performance of the camera (including lifespan) shall not significantly deteriorate due to vibrations in the supporting structure.

Cameras shall be connected to the image processor hardware via suitable low loss cabling.

10.4 Illuminators

Where scene illuminators are required, they shall be mounted directly on support structures, either over or beside the carriageway, as specified.

The performance of the illuminator unit (including lifespan) shall not deteriorate significantly due to vibrations in the supporting structure.

Illuminator units shall be connected via suitably rated cabling.

10.5 Cable Installation

Where cables are installed above ground they shall be installed in metallic conduit in accordance with MRTS91.

11 Electrical

The electrical requirements defined in MRTS201 apply to work under this Technical Specification. In addition, each ANPR system installation shall have a battery power supply rechargeable from solar power or mains power when available and practical as specified in MRTS201.

12 Telecommunications requirements

The telecommunications requirements defined in MRTS201 apply to work under this Technical Specification.

In addition, the ANPR system shall be equipped with at least one EIA RS232 serial port and an Ethernet port using industry-standard secure shell FTP, secure shell telnet and HTTPS over Ethernet™ protocols.

The connection must cope with high latency network connections.

13 Testing and commissioning

The testing and commissioning requirements defined in MRTS201 apply to work under this Technical Specification.

In addition, as a minimum, the Contractor shall demonstrate and certify that the accuracy of the system meets the requirement in Clause 7.2.5.1.

14 Documentation

The documentation requirements defined in MRTS201 apply to work under this Technical Specification.

15 Training

The training requirements defined in MRTS201 apply to work under this Technical Specification.

16 Maintenance

The maintenance requirements defined in MRTS201 apply to work under this Technical Specification.

17 Handover

The handover requirements defined in MRTS201 apply to work under this Technical Specification.