



# ROAD SAFETY CAMERAS

## Intelligent transport systems (ITS) delivery specification

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### **More information**

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# 1 Scope

## 1.1 Purpose

The purpose of this document is to specify the minimum requirements for the procurement and installation of road safety camera (RSC) systems used for traffic rule enforcement and road safety purposes by the Principal.

### 1.1.1 NZTA ITS class

006 Cameras – Equipment used to view and capture footage of activity on the transport network.

[Class definitions](#)

## 1.2 Scope

This delivery specification sets out the requirements for the supply and installation of RSC systems.

This specification covers the following RSC system types:

- i. **Speed cameras** monitor vehicles within the detection zone and capture evidence of vehicles travelling above the posted speed limit. Both spot speed cameras and mobile spot speed cameras are covered.
- ii. **Redlight cameras** monitor vehicles within the detection zone and capture evidence of vehicles during the redlight phase.
- iii. **Dual cameras** monitor vehicles within the detection zone and capture evidence of vehicles travelling above the posted speed limit and/or during the redlight phase.
- iv. **Average speed/point-to-point (P2P) cameras** monitor vehicles at the detection zone of entry and exit point and capture evidence of vehicles travelling at an average speed above the posted speed limit.

The following are not covered in this specification:

- i. camera management server hardware
- ii. back-office equipment for offence file processing
- iii. mobile phone and seatbelt detection.

## 2 Functional requirements

*This section outlines what the equipment and systems need to do (functional), and how they need to do it (non-functional).*

### 2.1 Vehicle detection

#### 2.1.1 Speed detection

The RSC systems must have the ability to detect and calculate the speed and direction of all types of moving vehicles.

##### 2.1.1.1 Speed accuracy

The speed detection accuracy must be within a tolerance of  $\pm 2$ km/h from 30km/h to 250km/h across all vehicle types in both approaching and receding directions.

#### 2.1.2 Redlight detection

The RSC systems must have the ability to detect vehicles that cross the stop line during a redlight phase.

#### 2.1.3 Lane detection

The RSC systems must be able to identify the lane on which the vehicle is detected in a multi-lane (minimum of two lanes) road. This applies to vehicles travelling into two streams of traffic that flow in opposite directions.

#### 2.1.4 P2P

The RSC systems must be able to detect the travelling vehicle in a consistent position within the designated entry and exit zone.

#### 2.1.5 Vehicle classification detection

The RSC systems must be able to classify vehicle type based on the length of the vehicle, and the threshold must be configurable.

## 2.2 Camera

### 2.2.1 Static image

The camera must be able to capture an image within the detection range of the sensor and transmit data to the back-end system. The captured image must show:

- i. a detected vehicle
- ii. the lane of the detected vehicle
- iii. the number plate of the detected vehicle
- iv. the roadway and, if a redlight camera, the traffic signal lights.

### **2.2.1.1 Resolution**

The camera must provide a minimum resolution of 5MP or higher.

### **2.2.1.2 Images (P2P)**

The camera must capture an image of the detected vehicle passing the entry and exit points of the enforcement zone.

### **2.2.1.3 Automatic exposure control**

The camera must have automatic exposure control to maintain the light level as it changes throughout the day.

### **2.2.1.4 Frame rate**

The camera must provide a minimum of 1ms shutter speed and be able to capture multiple images of vehicles with a minimum of two images per enforcement record.

### **2.2.1.5 Data bar**

The captured image must have a data bar with the following information:

- i. date and time of the detection
- ii. site location
- iii. lane of the detected vehicle
- iv. speed of the detected vehicle
- v. elapsed time (redlight detection).

## **2.2.2 Automatic number plate recognition (ANPR)**

If the RSC systems have ANPR capability, then it must meet the following requirements.

### **2.2.2.1 Number plate detection**

The ANPR system must be able to read the number plate, which means isolating the number plate within the image, carrying out optical character recognition, and producing a machine-readable enumerated data field of the number plate.

### **2.2.2.2 Detection rate**

The ANPR system must detect a minimum of 95% of vehicles passing through the detection zone.

### **2.2.2.3 Capture rate**

The ANPR system must capture a minimum of 95% of all detected vehicles.

### **2.2.2.4 Accuracy rate**

The ANPR system must be able to read and match all numbers and/or letters on the number plate with a minimum of 95% accuracy of the captured images.



### 2.2.3 Illuminator

The RSC systems must use an infrared illuminator and must be able to apply correction to any infrared illumination colour shift under low light conditions. Visible light illuminators are not allowed to be used.

### 2.2.4 Video

The camera must be able to produce videos to track the movement of vehicles or verify if emergency services vehicles have beacons.

#### 2.2.4.1 Frame rate

The video must provide a minimum frame rate of 25fps.

#### 2.2.4.2 Resolution

The video must provide a minimum resolution of 1920 × 1080 pixels.

#### 2.2.4.3 Duration

The video must provide a minimum of 10 seconds duration in total, comprising 5 seconds before and after the offences.

## 2.3 Log records

The RSC systems shall be able to produce a record of the logs shown in Table 1 below.

Types of logs	Description
Incident logs	To record the information about a detected incident
System logs	To record the operating status of the system
Radar logs	To record raw data from the sensor
Event logs	To record a system event such as system settings change, system alarm, etc.
Deployment logs	To record information about vehicle events

Table 1. Types of log records

### 2.3.1 Data storage

The RSC systems shall be able to store system files, incident records and log records. The following requirements shall apply for storage capacity:

- i. a minimum of 7 days of data or 70,000 incident-related data for speed, redlight and dual cameras.
- ii. a minimum of 1 day of data or 200,000 detection-related data for average speed/P2P cameras.

## 2.4 Operational functions

### 2.4.1 Operating state

The RSC systems must be able to operate in a minimum of two different states (as shown in Table 2) to fulfil operational requirements.

Operating state	Description
Enforcement state	System is in live infringement mode
Maintenance state	System is in testing and maintenance mode

Table 2. Types of operating states

### 2.4.2 Monitoring

The RSC systems must allow remote monitoring of system alarms within the Principal's network.

### 2.4.3 Administration

The RSC systems must allow the Principal to perform administration tasks remotely within the Principal's network such as, but not limited to:

- i. updating the software remotely and not relying on updates by physical means (eg the use of a flash drive or direct laptop connection)
- ii. rolling back to the last previous version (n-1) as a minimum.

### 2.4.4 Configuration

The RSC systems must allow remote access within the Principal's network to modify configurable settings of systems.

### 2.4.5 Time synchronisation

The RSC systems must allow frequent time synchronisation through the Network Time Protocol (NTP) to an accurate time source.

### 2.4.6 Security functions

Please consult the Principal's security team for security requirements. Security functions must comply with New Zealand Institute of Safety Management (NZISM) security control.

## 2.5 Compliance with protocols and other control interfaces

The RSC systems shall be configured to comply with the Principal's prevailing protocols and other control interfaces.

## 3 Performance requirements

*This section outlines the reliability and availability requirements of equipment, which may require independent certification and/or declarations of conformity.*

### 3.1 Operational life

The RSC systems shall be designed with a minimum operational life of not less than 10 years without degradation of performance quality.

### 3.2 Resistance to the effects of external conditions

Equipment that is deemed fit for purpose is expected to continue to operate effectively exposed to the New Zealand environment. It is essential that materials and manufacturing processes take this into account.

The RSC systems shall be capable of continuous, normal operation and maintaining performance criteria in the conditions described below:

- i. installed and operated in direct sunlight
- ii. ambient temperature range between  $-25^{\circ}\text{C}$  and  $+50^{\circ}\text{C}$
- iii. humidity between +5% and +95% non-condensing
- iv. lighting (dawn, dusk, day and night)
- v. weather (heavy rain, brilliant sunshine, overcast skies, snow and thick fog)
- vi. conditions, both permanent and temporary, that are unique to the specified location
- vii. vibrations expected in the installed location
- viii. pollution effects such as surface corrosion.

### 3.3 Protection from dust and moisture

The sensor housing and the enclosure shall provide a minimum International Protection (IP) rating of IP65 based on IEC 60529:1989+AMD1:1999+AMD2:2013 *Degrees of protection provided by enclosures (IP code)*.

### 3.4 Microwave beam

#### 3.4.1 Radio spectrum

The microwave beam transmitted from the radar shall operate within New Zealand's general user radio licence spectrum of 24GHz to 24.25GHz.

#### 3.4.2 Frequency tolerance

The transmitted microwave beam frequency of the radar should be within  $\pm 125\text{MHz}$  of the centre frequency.

#### 3.4.3 Beam coverage

For fixed RSC systems, the radar beam angle shall be sufficient to provide coverage of six traffic lanes up to 150m from the radar transmitter.

For mobile RSC systems, the radar beam angle shall be sufficient to provide coverage of three traffic lanes up to 100m from the radar transmitter.

#### **3.4.4 Beam power**

The recommended output power level of the transmitted microwave beam is  $-10\text{dBW}$  equivalent isotropic radiated power (EIRP) and shall not exceed  $0\text{dBW}$  EIRP.

### **3.5 Maintainability**

The RSC systems shall be designed:

- i. so all the components can be easily replaced in the field
- ii. to be installed and maintained by the Contractor as per supplied documentation
- iii. to minimise operational downtime
- iv. to be easily cleaned (including graffiti).

## 4 Technical requirements

*This section outlines specific technical and physical constraints for the equipment.*

### 4.1 Electrical safety

All ITS equipment shall comply with and be installed in accordance with the Electricity (Safety) Regulations 2010 (SR 2010/36).

#### 4.1.1 Installation of electrical equipment

The Contractor is required to supply a certificate to confirm the equipment has been installed correctly and complies with AS/NZS 3000:2018 *Electrical installations – known as the Australian/New Zealand Wiring Rules*.

### 4.2 Electrical

#### 4.2.1 Power supply

The RSC systems shall be able to be powered from a 230V AC power supply and 12V DC power supply for mobile RSC systems.

#### 4.2.2 AC operating voltage and frequency variation

Variations in the nominal supply voltage and frequency shall not affect the RSC systems' performance and shall conform to AS/NZS 61000.2.2:2023 *Electromagnetic compatibility (EMC), Part 2.2 Environment – Compatibility levels for low frequency conducted disturbances and signalling in public low-voltage power supply systems*.

#### 4.2.3 Radio standards

The RSC systems shall comply with the Radiocommunications Regulations (Radio Standards) Notice 2023 and shall conform to:

- i. AS/NZS 4268:2017 *Radio equipment and systems – Short range devices – Limits and methods of measurement*
- ii. EN 302 288-1 V1.61 *Electromagnetic compatibility and Radio spectrum Matters (ERM); Short Range Devices; Road Transport and Traffic Telematics (RTTT); Short range radar equipment operating in the 24 GHz range; Part 1: Technical requirements and methods of measurement*.

#### 4.2.4 Electromagnetic compatibility

The RSC systems shall comply with the Radiocommunications Regulations (EMC Standards) Notice 2019. The RSC systems must not interrupt any external equipment/devices and shall conform to AS/NZS CISPR 11:2011 *Industrial, scientific and medical equipment – Radio-frequency disturbance characteristics – Limits and methods of measurement*.

## **4.2.5 Electrical surge protection**

All equipment shall be internally protected against damage resulting from:

- i. lightning strikes near the RSC systems
- ii. electrical transients on power cabling
- iii. electrical transients on internal and external wiring
- iv. electromagnetic interference
- v. static electrical discharge.

## **4.3 Mechanical**

### **4.3.1 Vibration and shock resistance**

The RSC systems shall be capable of withstanding vibration and shock and shall conform to:

- i. IEC 60068-2-31:2008 *Environmental testing – Part 2-31: Tests – Test Ec: Rough handling shocks, primarily for equipment-type specimens*
- ii. IEC 60068-2-64:2008+AMD1:2019 CSV *Environmental testing – Part 2-64: Tests – Test Fh: Vibration, broadband random and guidance.*

## **4.4 Environment**

### **4.4.1 Environmental conditions**

The RSC systems shall be capable of withstanding New Zealand environmental conditions and shall conform to:

- i. IEC 60068-2-1:2007 *Environmental testing – Part 2-1: Tests – Test A: Cold*
- ii. IEC 60068-2-2:2007 *Environmental testing – Part 2-2: Tests – Test B: Dry heat*
- iii. IEC 60068-2-78:2012 *Environmental testing – Part 2-78: Tests – Test Cab: Damp heat, steady state*

## **4.5 Physical obstruction (mobile)**

The operation of mobile RSC systems deployed inside a vehicle shall not be affected by any window of the vehicle.

## **4.6 System integration**

The RSC systems shall support the communication interface.

## **4.7 Documentation, software and licensing**

### **4.7.1 Documentation**

The Contractor shall supply original equipment manufacturer maintenance, service and operations guidelines and manuals, which will include maintenance schedules and procedures, handling and storage instructions, and a spares list. The documents must be written in English.

#### **4.7.2 Software and licensing**

The Contractor will be required to provide up-to-date and patched software at handover to Principal. This must include any specialist software required to administer or monitor the equipment.

The Contractor must include any licensing requirements for use at handover to the Principal, along with any associated terms, conditions and licensing costs.

## 5 References

This section lists all references included in this document.

### 5.1 Industry standards

Standard number/name
AS/NZS 3000:2018 Electrical installations – known as the Australian/New Zealand Wiring Rules
AS/NZS 4268:2017 Radio equipment and systems – Short range devices – Limits and methods of measurement
AS/NZS CISPR 11:2011 Industrial, scientific and medical equipment – Radio-frequency disturbance characteristics – Limits and methods of measurement
AS/NZS IEC 61000.2.2:2023 Electromagnetic compatibility (EMC), Part 2.2 Environment – Compatibility levels for low-frequency conducted disturbances and signalling in public low-voltage power supply systems
EN 302 288-1 V1.61 Electromagnetic compatibility and Radio spectrum Matters (ERM); Short Range Devices; Road Transport and Traffic Telematics (RTTT); Short range radar equipment operating in the 24 GHz range; Part 1: Technical requirements and methods of measurement
IEC 60068-2-1:2007 Environmental testing – Part 2-1: Tests – Test A: Cold
IEC 60068-2-2:2007 Environmental testing – Part 2-2: Tests – Test B: Dry heat
IEC 60068-2-31:2008 Environmental testing – Part 2-31: Tests – Test Ec: Rough handling shocks, primarily for equipment-type specimens
IEC 60068-2-64:2008+AMD1:2019 CSV Environmental testing – Part 2-64: Tests – Test Fh: Vibration, broadband random and guidance
IEC 60068-2-78:2007 Environmental testing – Part 2-78: Tests – Test Cab: Damp heat, steady state
IEC 60529:1989+AMD1:1999+AMD2:2013 Degrees of protection provided by enclosures (IP code)
ISO/IEC 17025:2017 General requirements for the competence of testing and calibration laboratories

### 5.2 NZTA standards, specifications and resources

#### 5.2.1 Standards and specifications

See the [NZTA website](#) for the latest versions of the ITS S&S listed below.

Document name

#### 5.2.2 Resources

Document name/code



### 5.3 Legislation

Name
Electricity (Safety) Regulations 2010 (SR 2010/36)
Radiocommunications Regulations (Radio Standards) Notice 2023
Radiocommunications Regulations (EMC Standards) Notice 2019

### 5.4 Other resources

Name
Land Transport (Road User) Rule 2004
AP-R415-12 AUSTROADS RESEARCH REPORT – Point-to-Point Speed Enforcement
New Zealand’s general user radio licence spectrum

### 5.5 ITS standard drawings

See the [NZTA website](#) for the latest versions of the ITS standard drawings listed below.

Drawing number

## 6 Terminology used in this document

Term	Definition
DRAFT	The document is being written and cannot be used outside of NZTA.
FINAL DRAFT (pending ratification)	The document has been finalised and is pending approval and ratification by NZTA. It can be used for procurement at this status.
RATIFIED	The document is an official NZTA document. NZTA projects and other road controlling authorities connected to NZTA back-end systems must include this document in the contracts. The obligation to follow the requirements in this document would come from the inclusion of the S&S document in the contract.
RETIRED	The document is obsolete, and/or superseded.
AC	Alternating current
ANPR	Automatic number plate recognition
AS/NZS	Australian/New Zealand standard
dBW	Decibel watt
DC	Direct current
EIRP	Equivalent isotropic radiated power
EMC	Electromagnetic compatibility
fps	Frames per second
GHz	Gigahertz
IEC	International Electrotechnical Commission
IP code	International Protection code (sometimes interpreted as Ingress Protection code)
ISO	International Organization for Standardization
ITS	Intelligent transport system(s)
km/h	Kilometres per hour
MHz	Megahertz
MP	Megapixels
ms	Milliseconds
mW	Milliwatts
NTP	Network Time Protocol
NZISM	New Zealand Institute of Safety Management
NZTA	NZ Transport Agency Waka Kotahi
P2P	Point-to-point
Radar	Radio detecting and ranging
RSC	Road safety camera

Term	Definition
S&S	Standards and specifications
V	Voltage

## 7 Content to be redirected

*This section records any circumstances where content from this document will be reclassified and moved into future documents. This table is then updated with a reference to the new location.*

Section reference	Section name	Future document	Class

## 8 Document control

### 8.1 Document information

Document number	ITS-SPEC-RSC-202410
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[IF RETIRED] New document details	
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### 8.2 Document owner

<b>Role</b>	ITS S&S steering committee
<b>Organisation</b>	NZTA

### 8.3 Document approvers

*This table shows a record of the approvers for this document.*

Approval date	Approver	Role	Organisation
10/09/2024	Endorsed by Technical Standard Committee	Technical Standards Committee	NZTA
26/09/2024	Recommended by the Ratification Group to approve this document	Ratification Group	NZTA
14/10/2024	Approved by NMPAS	Delegated approver	NZTA

## 8.4 Full version history

*This table shows the full history of changes made to this document, both minor and major, in chronological order, since the document was first authored.*

Minor versions are numbered 0.1, 0.2 etc until such point as the document is approved and published, then it becomes 1.0 (major version). Subsequent edited versions become 1.1, 1.2 etc, or if it's a major update 2.0, and so on.

Version	Date	Author	Role and organisation	Reason
0.1	28/03/2024	Ee Chiang Sim Liang Zhao	Senior Engineer, SGS Australia Senior Engineer, SGS Australia	Draft for NZTA Expert Panel
0.2	10/05/2024	Ee Chiang Sim Liang Zhao	Senior Engineer, SGS Australia Senior Engineer, SGS Australia	Updated document after Expert Panel review and workshop
0.3	26/06/2024	Ee Chiang Sim Liang Zhao	Senior Engineer, SGS Australia Senior Engineer, SGS Australia	Updated document after industry consultation
0.4	18/09/2024	Anandita Pujara	Document Manager, NZTA	Updated section 1
0.5	24/09/2024	Anandita Pujara	Document Manager, NZTA	Updated as per Ratification Group feedback
0.6	22/10/2024	Matthew Bauer	Editor, Clear Edit NZ	Copyedit
1.0	23/10/2024	Anandita Pujara	Document Manager, NZTA	Issued as approved version 1.0