



CLOSED-CIRCUIT TELEVISION — WEB ITS Delivery Specification

18 OCTOBER 2022
0.8

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More information

If you have further queries, contact the ITS S&S team via email: itsspec@nzta.govt.nz

More information about intelligent transport systems (ITS) is available on the Waka Kotahi website at <https://www.nzta.govt.nz/its>

This document is available on the Waka Kotahi website at <https://www.nzta.govt.nz/itsspecs>

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1 DOCUMENT CONTROL

1.1 Document information

Document number	ITS-02-006-202211-SPEC-CCTV-WEB
Previous document number/s (if applicable)	ITS-07-01
Document status DRAFT PENDING RATIFIED RETIRED	DRAFT (industry consultation)
[IF RETIRED] New document details	
Online ISBN number	
Document availability	The controlled version of this document can be accessed from https://www.nzta.govt.nz/roads-and-rail/intelligent-transport-systems/standards-and-specifications/its-current-interim-and-legacy-standards-and-specifications

1.2 Document owner

Role Head of Technology Engineering
Organisation Waka Kotahi

1.3 Document approvers

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

Approval date	Approver	Role	Organisation
DD/MM/YYYY			

1.4 Version history – major changes

Document version control is the process of tracking and managing different versions (or drafts) of a document to easily identify the current iteration of a file.

This table shows a record of all major (published) versions of this document (**for Waka Kotahi use only**). To record minor versions (author updates, amendments etc), go to section 9 Full version history.

Version	Date	Author	Role and organisation	Reason
0.8	18/10/2022	Gary Nates	Lead author, Beca Ltd	Draft issued for industry consultation
1.0	DD/MM/YYYY			
2.0	DD/MM/YYYY			
3.0	DD/MM/YYYY			

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2 TERMINOLOGY USED IN THIS DOCUMENT

Term	Definition
DRAFT	The document is being written and cannot be used outside of Waka Kotahi.
PENDING	The document has been finalised and is pending approval and ratification by Waka Kotahi. It can be used for procurement at this status.
RATIFIED	The document is an official Waka Kotahi document. Road controlling authorities are obliged to follow a document with this status.
RETIRED	The document is obsolete, and/or superseded.
AC	Alternating current
AS/NZS	Australian/New Zealand standard
CCTV	Closed-circuit television
dB	Decibels
DC	Direct current
DHCP	Dynamic Host Configuration Protocol
fps	Frames per second
IEC	International Electrotechnical Commission standard
IEEE	Institute of Electrical and Electronics Engineers standard
IP	Internet Protocol
ITS	Intelligent transport system
JPEG	Standard image format for containing lossy and compressed image data
lux	Luminous intensity
Mb	Megabit
NIWA	National Institute of Water and Atmospheric Research
OEM	Original equipment manufacturer
ONVIF	Open Network Video Interface Forum
PoE	Power over Ethernet
PTZ	Pan-tilt-zoom [camera]
SFP	Small form-factor pluggable
TCP	Transmission Control Protocol
TOC	Transport operations centre
USB	Universal serial bus
W	Watts
W/m ²	Watts per square metre
WDR	Wide dynamic range

3 OVERVIEW AND OUTCOMES

This section defines the purpose of the equipment within the operational system.

3.1 Purpose

The purpose of this document is to specify the requirements for the procurement of closed-circuit television (CCTV) web cameras used primarily by Waka Kotahi to show traffic conditions to the public. These cameras are intended to be connected to the Waka Kotahi network environment.

Delivery assurance is managed through a series of delivery specifications which support procurement and systems integration. The key risks that specifications address are ensuring the correct equipment is being procured, that it will integrate with operational systems and will deliver the correct functionality and performance requirements.

3.2 Overview

3.2.1 Definition

Web cameras provide the public with the ability to check captured images of traffic conditions from various websites. These cameras can be either:

- i. dome cameras with the ability to pan, tilt and zoom (PTZ), but which are kept in a fixed position
- ii. fixed cameras without PTZ ability.

3.2.2 Waka Kotahi ITS class

[Class definitions](#)

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

3.3 Scope

This delivery specification sets out the requirements for the procurement of the following types of CCTV cameras:

- i. dome cameras
- ii. fixed CCTV cameras.

In general, the contractor shall supply web cameras, camera mounting and appropriate housing as required, in line with this delivery specification.

This delivery specification does not cover operational cameras or any other forms of cameras.

3.4 Outcomes

The critical outcome for web cameras is for the public to be able to view low-quality images of the transport network in order to provide enough information for users to make decisions about their journeys.

3.4.1 Operational

The intended operational outcomes of this delivery specification are to:

- i. ensure the equipment is accessible for use (the reliability of the equipment will ensure that it is out of service for maintenance for very short periods)
- ii. provide the ability to view images in varying conditions that are of a high enough quality for situational awareness.

3.4.2 For users of the transport network

Web cameras allow transport network users to make informed journey choices.

3.4.3 For road controlling authorities and transport operations centres

Web cameras allow transport network users to make informed journey choices, thereby reducing demand on the network.

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4 FUNCTIONAL REQUIREMENTS

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

4.1 Video image

All cameras must provide the functionality to provide high-quality video images from a range of lighting conditions that may change due to time of day or weather conditions. This may include open-air environments and enclosed tunnel environments.

4.1.1 Resolution

Cameras must provide a density of resolution to display the video image clearly and with an acceptable level of detail.

4.1.1.1 Minimum resolution

Cameras must provide a minimum resolution of 720 pixels or higher.

4.1.2 Frame rate

Cameras must provide a frame rate that will display a smooth image and allow the tracking of moving vehicles.

4.1.2.1 Minimum frame rate

Cameras must provide a minimum frame rate of 20fps or higher.

4.1.3 Downscaling

Cameras must provide the ability to manually downscale the resolution and frame rate to maintain a sufficient latency and bandwidth.

4.1.3.1 Downscaling resolution range

The camera resolution must be able to be downscaled to 540 pixels or lower.

4.1.3.2 Downscaling frame rate range

The frame rate of the camera must be able to be downscaled to 15fps or lower.

4.1.4 Iris control

The lens must have iris control to maintain the light level as it changes throughout the day.

4.1.4.1 Automatic iris control

Cameras must have automatic iris control.

4.1.4.2 Manual iris control

Cameras shall have the ability to remotely switch to manual iris control.

4.1.5 Wide dynamic range (WDR)

Cameras must display images clearly where the light levels within an image differ significantly.

4.1.5.1 True WDR

Cameras must provide true WDR. Digital WDR is not acceptable.

4.1.5.2 Minimum WDR

Cameras must provide a minimum WDR of 90dB.

4.1.6 Day/night functionality

Cameras must display images clearly in both day and night-time environments and easily switch between the two environments.

4.1.6.1 Automatic day/night functionality

Cameras must have the ability to switch automatically between day/night functionality.

4.1.6.2 Manual day/night functionality

Cameras must have the ability to switch remotely between day/night functionality.

4.1.7 Illumination

Cameras must display images clearly in low-light environments, including at night-time.

4.1.7.1 Minimum illumination

Cameras must produce a clear image where ambient light levels are at a minimum of 0.7 lux.

4.1.8 JPEG snapshot

All web cameras must provide the JPEG snapshot feature.

4.2 Zoom

4.2.1 Zoom operation

Dome cameras should provide zoom to enlarge objects beyond the lens focal point. This functionality is actioned at setup and is not required during normal operations.

Fixed cameras do not need to provide zoom operations, but must be selected with the correct focal lens to be suitable for its operational purpose.

4.2.1.1 Optical zoom

Cameras must provide a minimum optical zoom of 30x using physical lenses.

4.2.1.2 Digital zoom

In addition to the optical zoom, cameras must also provide a minimum of 12x digital zoom without distorting the image.

4.3 Camera movement

Dome cameras must provide an angular movement in the horizontal plane (pan) and pitch in the vertical plane (tilt). This functionality is actioned at setup and not required during normal operations.

Fixed cameras do not need to provide camera movement functionality.

4.3.1 Pan operation

To view beyond the camera's angle of coverage in the horizontal plane, cameras must be able to swivel, known as panning. This functionality is actioned remotely.

4.3.1.1 Pan range

Cameras must provide a pan of 360° rotation.

4.3.2 Tilt operation

To view beyond the angle of coverage in the vertical plane, cameras must be able to pitch, known as tilting. This feature is actioned remotely.

4.3.2.1 Tilt range

Dome cameras must provide +10° (above horizontal) to -90° (below horizontal) of tilt.

4.3.3 Camera position reporting

Cameras must be capable of displaying the direction the camera is orientated. This should be achieved without the need for calibrating or programming.

4.3.3.1 In-built camera position reporting

Cameras must be able to provide an in-built digital or absolute magnetic compass device to display the direction the camera is orientated. This display should be configurable and be able to be switched off.

4.3.4 Preset positions

A minimum of 10 remotely selectable position presets must be available (one preset entry defines a single XYZ orientation of the camera, including the level of zoom). These presets must be able to be adjusted remotely as required.

4.4 Privacy operations

All cameras must provide the functionality to blur or obscure private property or assets, such as neighbouring buildings.

4.4.1 Privacy zones

All cameras must provide programmable privacy zones which shall consist of an opaque polygon superimposed over the image to obscure parts of the field of view. The zones should move across the output image as appropriate to keep the desired zone covered as the camera moves and zooms.

4.4.1.1 Minimum number of privacy zones

Each camera must provide a minimum of 12 privacy zones.

4.5 Security functions

4.5.1 Username and passwords

All usernames and passwords need to be configurable, including defaults.

Cameras need to allow for the creation of new usernames.

4.5.1.1 Characters

Usernames and passwords need to allow for lower case, upper case and numbers and special characters.

4.5.1.2 Password length

The minimum password length must be 12 characters or more.

4.5.2 Logs

Cameras must provide a record of access logs (to identify each instance that any user has accessed the camera) and fault logs.

4.5.2.1 Timestamps

All logs must be timestamped.

4.5.2.2 Source IP address

All access logs must include the source IP address.

4.5.2.3 Authentication

All access logs must include if the authentication was successful or not.

4.5.2.4 Log retention

Logs should be stored for at least three months before being deleted.

4.5.3 Time synchronisation

Cameras must allow time synchronisation through NTP servers.

4.5.3.1 NTP servers

Cameras must allow to be configured with three NTP servers, as a minimum.

4.5.4 Firmware updates

Cameras must allow for firmware updates remotely and not rely on updates by physical means (eg the use of a USB flash drive or direct laptop connection).

4.5.4.1 Firmware rollback

Cameras must allow for roll back to the last previous version (n-1) as a minimum.

Superseded

5 PERFORMANCE REQUIREMENTS

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

5.1 Operational life

Cameras shall be designed with a minimum operational life of not less than six years without degradation of performance quality.

5.2 External protection to dust and moisture

To prevent cameras from exposure to dust and water, camera housing shall provide a minimum IP66 ingress protection based on IEC 60529:1989+AMD1:1999+AMD2:2013 Degrees of protection provided by enclosures (IP code).

5.3 Resistance to the effects of external conditions

The operating environment of cameras can be relatively harsh. Equipment that is deemed fit for purpose is expected to continue to operate effectively exposed to the New Zealand environment as per the National Institute of Water and Atmospheric Research (NIWA). It is essential that materials and manufacturing processes take this into account.

Cameras shall be capable of continuous, normal operation (24 hours, seven days per week) and maintaining performance criteria in the conditions described below:

- i. installed and operated in direct sunlight
- ii. ambient temperature range between -25°C and $+55^{\circ}\text{C}$
- iii. maximum wind conditions likely to occur at the installation site as per AS/NZS 1170.2:2021 Structural design actions – Part 2: Wind actions
- iv. solar radiation with a value of up to $2000\text{W}/\text{m}^2$ at direct sunlight, incident at an angle of 30° from the vertical
- v. altitude up to 1000m
- vi. humidity between +10% and +95% non-condensing
- vii. conditions, both permanent and temporary, that may be unique to the specified location, eg instances of thick smoke and electromagnetic interference
- viii. vibrations expected in the installed location
- ix. marine environment.

6 TECHNICAL REQUIREMENTS

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

6.1 General

Cameras must be digital IP cameras.

6.2 Electrical requirements

6.2.1 Electrical supply

All cameras must be able to powered by all of the following methods:

- i. AC
- ii. DC
- iii. Power over Ethernet (PoE).

6.2.1.1 PoE standards

PoE should meet one of the following standards, based on the power requirements of the camera:

- i. up to 15W (IEEE 802.3af-2003 Standard for Information Technology – Telecommunications and Information Exchange Between Systems – Local and Metropolitan Area Networks – Specific Requirements - Part 3: Carrier Sense Multiple Access with Collision Detection (CSMA/CD) Access Method and Physical Layer Specifications – Data Terminal Equipment (DTE) Power Via Media Dependent Interface (MDI))
- ii. up to 30W (IEEE 802.3at-2009 Standard for Information technology – Local and metropolitan area networks – Specific requirements – Part 3: CSMA/CD Access Method and Physical Layer Specifications Amendment 3: Data Terminal Equipment (DTE) Power via the Media Dependent Interface (MDI) Enhancements)
- iii. up to 90W (IEEE 802.3bt-2018 Standard for Ethernet Amendment 2: Physical Layer and Management Parameters for Power over Ethernet over 4 pairs).

6.3 System integration

6.3.1 Camera protocol support

Cameras must be listed as compliant under the ONVIF Profile S Specification v1.3 protocol conformance. Camera manufacturer must be a member of the ONVIF alliance.

6.3.2 Codecs

Cameras must provide video streaming codecs that meet ONVIF Profile S Specification v1.3 protocol.

6.3.3 TCP/IP protocols

Cameras must:

- i. be TCP/IP network capable
- ii. support DHCP for IP address assignment.

6.3.4 HTTPS and SSH protocols

Cameras must provide HTTPS and SSH protocols

6.3.5 SNMP

Cameras that use SNMP must provide SNMPv3.

6.3.6 Network connectivity

Cameras must be able to be connected using either:

- i. RJ45 100/1000Mb copper Ethernet (required for all cameras)
- ii. small form-factor pluggable (SFP) module (optional).

6.3.7 Unicast and multicast

All cameras must be able to provide full functionality in a unicast-only network environment.

Cameras may provide multicast, but this is not required.

6.4 Security requirements

If cameras are to be deployed outside of a secure Waka Kotahi network, then security requirements must be discussed with a Waka Kotahi representative.

6.4.1 New camera makes and models

Camera makes and models new to Waka Kotahi will need to be assessed by the Waka Kotahi Security team.

6.5 Documentation, software and licensing

6.5.1 Documentation

Camera vendors must supply original equipment manufacturer maintenance, service and operations guidelines and manuals which will include maintenance schedules and procedures, handling and storage, and spares list.

6.5.2 Software and licensing

Camera vendors must supply all software and licensing required to configure and manage the CCTV to Waka Kotahi or its agent(s).

Superseded

7 REFERENCES

This section lists all external and Waka Kotahi references included in this document.

7.1 Industry standards

Standard number / name	Source	Licence type and conditions
IEC 60529:1989+AMD1:1999+AMD2:2013 Degrees of protection by enclosures (IP code)	IEC webstore	Available for purchase
AS/NZS 1170.2:2021 Structural design actions, Part 2: Wind actions	Standards NZ website	Available for purchase
IEEE 802.3af-2003 Standard for Information Technology – Telecommunications and Information Exchange Between Systems – Local and Metropolitan Area Networks – Specific Requirements – Part 3: Carrier Sense Multiple Access with Collision Detection (CSMA/CD) Access Method and Physical Layer Specifications – Data Terminal Equipment (DTE) Power Via Media Dependent Interface (MDI)	IEEE Standards Association website	Available for purchase
IEEE 802.3at Standard for Information technology – Local and metropolitan area networks – Specific requirement – Part 3: CSMA/CD Access Method and Physical Layer Specifications Amendment 3: Data Terminal Equipment (DTE) Power via the Media Dependent Interface (MDI) Enhancements	IEEE Standards Association website	Available for purchase
IEEE 802.3bt-2018 Standard for Ethernet Amendment 2: Physical Layer and Management Parameters for Power over Ethernet over 4 pairs	IEEE Standards Association website	Available for purchase
ONVIF Profile S Specification v1.3 Nov 2019	ONVIF website	Publicly available

7.2 Waka Kotahi standards, specifications and resources

7.2.1 Standards and specifications

See the [Waka Kotahi website](#) for the latest versions of the ITS design standards, delivery specifications and core requirements listed below.

Document name

7.2.2 Resources

Document name / code	Waka Kotahi website link

7.3 ITS standard drawings

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

Drawing number

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8 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

Superseded

9 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	09/11/2021	Gary Nates	Lead author, Beca Ltd	Draft for Waka Kotahi Expert Panel
0.2	07/12/2021	Final Word	Editorial services	Proofread latest version
0.3	16/03/2022	Gary Nates	Lead author, Beca Ltd	Draft response to Expert Panel workshop
0.4	05/04/2022	Final Word	Editorial services	Proofread latest version
0.5	12/04/2022	Gary Nates	Lead author, Beca Ltd	Response to Final Word comments
0.6	19/04/2022	Final Word	Editorial services	Further queries for author and ITS Working Group
0.7	06/05/2022	Gary Nates	Lead author, Beca Ltd	Response to Final Word comments
0.8	18/10/2022	Gary Nates	Lead author, Beca Ltd	Response to RCA and Security comments