WAKA KOTAHI
NZ TRANSPORT AGENCY

CLOSED-CIRCUIT TELEVISION

ITS Design Standard

18 OCTOBER 2022
1.0

New Zealand Government

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

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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
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Approval date	Approver	Role	Organisation

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 10 Full version history.

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1.0	18/10/2022	Gary Nates	Lead author, Beca Ltd	Draft updated for industry consultation
2.0	DD/MM/YYYY			
3.0	DD/MM/YYYY			

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RETIRED	The document is obsolete, and/or superseded.
ADSL	Asymmetric digital subscriber line
ANPR	Automatic number plate recognition
AS/NZS	Australian/New Zealand standard
CCTV	Closed-circuit television
CoO	Concept of operations
FAT	Factory acceptance testing
GSM	Global system for mobile communications
ITS	Intelligent transport systems
kA	Kiloampere
m	Metre
mm^2	Square millimetres
OPS	Operational cameras, for use by TOCs
PTZ	Pan-tilt-zoom [camera]
RAMM	Road Assessment and Maintenance Management system
SAT	Site acceptance testing
TOC	Transport operations centre
TTM	Temporary traffic management
UAT	User acceptance testing
µs	Microsecond
VDSL	Very high-speed digital subscriber line
WEB	Web cameras, viewed by the public

3 OVERVIEW AND OUTCOMES

This section defines the operational outcomes for intelligent transport systems with respect to the transport network.

3.1 Purpose

The purpose of this document is to specify the design requirements associated with the installation of closed-circuit television (CCTV) operational cameras and web cameras by Waka Kotahi. These cameras are intended to be connected to the Waka Kotahi operations environment and network.

Design assurance is delivered through a series of design standards. The standards ensure road network level operational outcomes and design for safety, security and maintainability are accounted for in solutions being delivered to Waka Kotahi. Design standards address risks typically generated at the front end of traffic corridors or infrastructure projects. Their objective is to ensure solutions address the correct operational need and solutions are fit for purpose.

3.2 Overview

3.2.1 Definition

CCTV cameras provide transport operations centres (TOCs) with operational visibility of key assets (known as OPS cameras) and provide the public with the ability to check traffic conditions from various websites (known as WEB cameras).

The type of camera used depends on the functionality requirements:

Pan-tilt-zoom (PTZ) cameras are large, high-quality, high-performance cameras for use on urban and high-volume traffic corridor environments.
Dome cameras are smaller, cost-effective cameras suited to areas where a full PTZ camera is not required. Dome cameras can be fixed or have PTZ functionality.
Fixed cameras are high-quality cameras but without PTZ ability.

For other forms of cameras such as incident detection cameras or automatic number plate recognition (ANPR) cameras, refer to the latest version on the Waka Kotahi ITS Standards and Specifications website.

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 design standard sets out the requirements for the location selection, installation and commissioning of a CCTV camera. The intent is to describe the considerations that the designer must address when designing these assets. The two types of CCTV described within this document are:

i. operational CCTV cameras

ii. web cameras.

Each new camera field installation shall typically consist of:

iii. camera, including lens and accessories
iv. housing, including pan-tilt mechanism (included with the camera)
v. communications interface equipment
vi. power supply
vii. CCTV pole (hinged or lowering pole) including pole foundation, or bracket (as required)
viii. Flange to connect CCTV to pole/bracket/mast arm
ix. roadside cabinet, plinth and apron
x. paved access area
xi. guardrail protection
xii. other accessories, as necessary.

The above list is not intended to be exhaustive and only provides high-level guidance to the designer. Requirements will vary from project to project and a wider understanding of the project must be understood.

For procurement of operational cameras, refer to the latest version of ITS delivery specification: Closed-circuit television – OPS.

For procurement of web cameras, refer to the latest version of ITS delivery specification: Closed-circuit television – WEB.

3.4 Outcomes

The outcomes of the project will be described in the concept of operations (CoO). Before design can be carried out, an understanding of why the asset is needed must be understood by the designer. This outcome requirement will change from project to project and therefore cannot be described in this design standard.

This design standard seeks to define best practice on the approach to design. The consideration of how the design meets the CoO is an important component of the design process.

Typical outcomes for operational CCTV cameras are to:

i. enable TOCs to have operational visibility of the road network and key assets
ii. enable decision support regarding network conditions
iii. provide first-level assessment before response arrives on-site
iv. enable situational awareness of the transport network
v. enable network performance analysis
vi. enable network safety analysis.

Typical outcomes for web cameras are for the public to view static images of the traffic conditions to make decisions about their journey, at a resolution that will not allow the public to identify individual people or vehicles.

3.4.1 Operational

The intended operational outcomes of this design standard 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
iii. ensure the camera is available and operational when required
iv. ensure the camera is compatible with the operations systems used by the TOCs.

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

Operational cameras provide awareness to the TOCs of the network that allows management of safety, incident response and demand.

4 DESIGN FOR OPERATION

This section defines the functionality required to achieve successful operation of the intelligent transport system.

Design must be carried out in the context of the operational outcomes of the specific project. Careful consideration should be given to the following.

4.1 Operational visibility

See the latest version of ITS core requirements standard: Minimum requirements for ITS.

In the above core requirements standard, operational visibility requirements are defined by road classification. This operational visibility should be incorporated within the CoO, refer to section 3.4 Outcomes of this design standard.

The level of camera visibility typically depends on the strategic importance of the road or whether an area is high-risk for incidents or congestion, eg the visibility within a high-volume tunnel might be 200% (at least two angles of all sections of the carriageway).

Where cameras are being installed on road corridors or shared use paths, the designer should consider the operational visibility of the corridor or path in its entirety. Consider mapping the location of any current cameras prior to embarking on choosing the location of any new cameras. This should include the current camera operating angles and operational sight lines, to identify where coverage is lacking or needing enhancement.

Some major assets such as tunnels may have additional operational visibility requirements. This may be over and above the requirements of the road classification that the asset is located within.

4.2 Site selection

The following sections list the design elements that must be met and considered when selecting individual camera locations. The site selection for the camera infrastructure must be able to meet the outcomes identified by the project and in the context of the CoO.

Assessment of the location of the camera must be carried out to verify the suitability of the location with regards to visibility achievable. This should be carried out by identifying lines of sight, typically using 3D modelling.

The TOC must be given an opportunity to agree to the final camera locations.

4.2.1 End-user requirements

The designer shall consider the following end-user requirements when choosing a camera location:

i. What is the purpose of a camera? The standard pole height is 15m to the flange plate on the top of the pole, but this may be excessive if the objective is to see under a structure or if there are tall trees at an intersection. Consider if a shorter pole or attaching the camera to an existing structure provides the required views.
ii. What is it that the user needs to see? The chosen location will ideally maximise what can be seen with a single camera (known as design sight lines). It is good practice to maximise the usability of the camera by positioning it in a location where it can be used to observe all approaches to an intersection or interchange, rather than just up and down the main highway.
iii. Is the camera too close to the viewed object so that it cannot all fit into a single view? For example, placing the camera on the corner of a large intersection where the intersection itself (aside from the approaches) is required to be viewed.

4.2.2 Privacy

Privacy of the public must be considered by the designer in the context of the CoO. The designer has two mechanisms that should be implemented:

i. Site selection, to maximise the view required by the CoO and minimise the unintended exposure of the public and the surroundings
ii. Privacy zones, a software add-on that must be configured for all cameras (see section 7.2.9 Privacy zones)

4.2.3 Environmental

The designer shall consider the topography of the traffic environment, as well as other environmental features that may impact viewing for end users. This should include the implications of climate change with special considerations to resilience, such as potential future inundation or increased natural hazards.

Visibility shadows (commonly known as blind spots) occur where an object obscures part of the view of the camera. These should be considered when selecting the optimal location of the camera. Where possible, visibility shadows should be minimised.

The designer may consider including extra cameras where a single camera does not provide the full required coverage for the location.

The closer the camera site is to a visibility shadow, the greater its impact on the field of view.

4.2.3.1 Infrastructure geometry

Cameras should be located on a crest where possible. This should maximise the coverage and minimise the visibility shadow caused by a change in gradient.

Cameras should be located on the outside of a curve where possible. This should maximise the coverage and minimise the visibility shadow caused by a change in the horizontal alignment.

For PTZ and dome cameras, placing them on the outside of the curve will also increase the angle of view and minimise the amount of panning required by the operator.

4.2.3.2 Trees and foliage

Trees and foliage are a common visibility shadow. Consider both the present state of trees and how the trees are likely to grow in the future. If areas are going to be planted, these may provide unwanted visibility shadows in the future.

4.2.3.3 Physical structures

There are many physical structures that provide visibility shadows. Common examples include:

i. buildings
ii. gantries
iii. signs
iv. pylons
v. tunnel entrances and exits
vi. fridge structures
vii. embankments.

Lighting poles only provide visibility shadows when placed very near a camera.

Consider the cumulative impact of multiple structures within the camera view.

4.2.3.4 Vehicle obstruction

Cameras that are located too low to the ground may have their field of view blocked by larger vehicles. This may include over-height vehicles.

Cameras must be located at a height to avoid the glare from headlights.

4.2.3.5 Glare from street lighting

Obstructional glare from street lights needs to be taken into account when designing camera locations.

4.2.4 General considerations

i. Ground conditions – this affects both the foundation design as well as the working environment for technicians when maintaining cameras. Avoid locations that are prone to flooding.
ii. Underground services (for freestanding poles) – this affects fine-tuning of the position and the foundation design and method of construction.
iii. Wind loading – poles can whip or shimmy in windy weather, which makes the image unwatchable and can affect the integrity of the camera and its mountings. The pole design, which in turn affects the foundations, must minimise vibration as much as possible. This can mean the use of a large-diameter pole or a pole with thicker wall construction. Sway is rarely a problem when viewed through the camera.
iv. Is there a local restriction on the maximum height of a camera pole? One way to gain height is to put the pole on the approach embankment to bridges over the alignment of a motorway or expressway, or at the top of a cutting slope.
v. The cost of providing communications and power to the camera should not be a driver in positioning it, except in the most extreme circumstances.

vi. The cabinet must be safely maintained without hazard to the cabinet, maintenance personnel or public. The cabinet and maintenance activities must not block intervisibility between all types of road user.

4.2.5 Highway lighting levels

Highway lighting has generally been designed to AS/NZS 1158.1.1:2005 Lighting for roads and public spaces – Part 1.1: Vehicular traffic (Category V) lighting – Performance and design requirements.

Where lighting exists, the designer shall assume that the lighting level is as per the minimum allowed.

Where no lighting exists or is proposed, the designer shall not assume that it will be provided. Thermal cameras may be considered for these locations.

4.2.6 Communication to site

A communications link is required to connect the camera to the Waka Kotahi national control system. This link directly impacts the quality of the video image for the end user and it is important to understand the bandwidth and latency at a site.

All communications to site should run through a roadside cabinet, as detailed in the latest version of ITS delivery specification: Roadside cabinets.

Where existing Waka Kotahi communications networks exist, use this backbone infrastructure in the first instance.

Projects must use the ITS communications network vendor contracted by Waka Kotahi and must follow approved Waka Kotahi network architecture.

Alternatively, there are a range of other communications options that can be utilised, including:

i. leased lines from commercial providers (eg VDSL, ADSL or fibre)
ii. mobile communications, such as GSM (though this is the least-preferred option)
iii. other communication options (such as satellite) that meets the bandwidth and latency 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.

Where bandwidth is constrained, TOCs should be engaged to determine an appropriate method of communication or consideration for scaling down resolution or frame rate.

4.2.6.1 Communication local link

The designer must provide a communication local link from the camera to the roadside cabinet that is fit for purpose. Consideration should be given to the load capacity of any cables, including any cabling length restrictions.

Physical cabling should be prioritised over wireless options as it is a more reliable communication link and less susceptible to security breaches.

A camera's WiFi or Bluetooth must not be used in the communication local link.

4.2.7 Electrical connection

Power supplies must be sized for the appropriate level and purpose of the camera.

Operational cameras need to be sized for supply of power for 24 hours a day.

All power connections will terminate into the local roadside communications cabinet power distribution unit in order to provide local power isolation, as detailed in the latest version of ITS delivery specification: Roadside cabinets.

4.3 Camera selection criteria

Cameras should be selected to achieve the appropriate CoO, operational visibility and the required design sight lines.

PTZ cameras must be considered for open environments where long views are required or where vehicles may need to be tracked over a long distance. PTZ should be selected where camera movement and zoom are the primary function of the camera.

Dome cameras must be considered for local views (eg intersections or local roads) and locations where vehicles need to be tracked over a short-to-medium distance.

Fixed cameras provide similar performance to PTZ cameras, without the ability to pan, tilt nor zoom. These should be considered for locations where camera movement is not required or movement needs to be prevented for constant surveillance.

Fixed cameras may be installed together with PTZ and dome cameras to prevent operation contention. This provides the flexibility of a constant view of the traffic environment with the flexibility of tracking and focusing on areas of interest on the carriageway/road corridors for operational purposes.

Selection criteria for operational cameras can be found in Table 1 and selection criteria for web cameras can be found in Table 2.

Criteria	Camera type		
	PTZ	Dome	Fixed
Motorway and expressway (including ramps)	✓		✓
Urban road environments including intersections (non-motorway and expressway)		✓	✓
Rural road environments (medium or long views required)	✓	✓	✓
Shared-use paths		✓	✓
Fixed view to prevent movement (eg viewing under a bridge)			✓

Table 1. Selection criteria for operational cameras

Criteria	Camera type		
	PTZ	Dome	Fixed
Motorway and expressway (including ramps)		✓	✓
Urban road environments including intersections (non-motorway and expressway)		✓	✓
Rural road environments		✓	✓
Shared-use paths		✓	✓

Table 2. Selection criteria for web cameras

4.4 Installation

Cameras may be installed either on a dedicated freestanding pole or mounted onto an existing structure.

The placement of the poles, bracket or mast arms must not obscure the view for road users of current infrastructure or street furniture, including signs.

With all methods of installation, cameras must be mounted to avoid vibration and sway. Poles can whip or shimmy in windy weather, which makes the image unwatchable and can affect the integrity of the camera and its mountings.

If a camera is located at the highest point on a structure, then the cameras must be installed with a lightning rod and be earthed appropriately. The lightning rod and its cables should be positioned to prevent obscuring the desired viewing angles at all levels of zoom of the camera.

4.4.1 Freestanding pole

Cameras may be installed on one of the following three types of poles:

i. hinge folding pole
ii. wind-down pole
iii. rigid pole (not preferred).

Rigid poles require the use of additional plant to raise technicians to the operating height of the camera (such as a cherry picker). This exposes technicians to a working-at-height risk which could be prevented by selecting a different type of pole. This also increases the time needed for fault and maintenance activities, leading to cameras being available for less time operationally.

All poles must provide a flange on which a camera can be installed.

Where poles are used, cables must run within the pole. Request a departure for an alternative arrangement.

For details on the pole requirements and considerations, see the latest version of ITS design standard: Civil and structural requirements.

4.4.2 Mounting brackets or mast arms

Cameras may be installed onto existing structures with the use of a mounting bracket or mast arms. These structures may include:

i. gantries
ii. retaining walls
iii. traffic signal poles.

Where possible, brackets and mast arms should allow cameras to be brought to a safe, accessible level to allow technicians access for installation and maintenance.

4.4.3 Roadside cabinets

All cameras will require to be connected to a roadside cabinet. This will provide both communication links and power to the camera and pole (if required).

If a roadside cabinet is present near the camera location, consider connecting to the existing cabinet (if capacity allows).

Consider positioning the camera so it can view its own cabinet, if possible.

See the latest version of ITS delivery specification: Roadside cabinets.

4.4.4 Site acceptance testing

Further requirements including, but not limited to, factory acceptance testing (FAT), site acceptance testing (SAT), user acceptance testing (UAT), spare parts inventory, service manuals, warranty and defects liability are outside the scope of this design standard.

SAT shall be undertaken as required following installation and prior to commissioning. This SAT may include, but is not limited to:

i. any repeat FAT as deemed appropriate
ii. testing of the:
   - power supply and back-up power supply
   - communications link(s)
   - camera image and functions including movement and zoom (where required)
   - presets
   - privacy masks
iii. identifying known visibility shadows or limits to the camera view
iv. inspection of the site.

4.4.5 User acceptance testing

Further requirements including, but not limited to, FAT, SAT, UAT, spare parts inventory, service manuals, warranty and defects liability are outside the scope of this design standard.

Prior to commissioning, the contractor is required to have user acceptance testing (UAT) completed and approved. This is usually undertaken by the TOC directly from the operations centre (given they are the end users for operational cameras and contact for web cameras).

This UAT may include, but is not limited to:

i. Testing:
   - latency
   - bandwidth
   - camera image and quality
   - camera functionality, including presets and switching between automatic and manual functions
   - full camera movement and zoom (if available)
   - response times when actioning the camera
   - during day time and night time

ii. confirming known visibility shadows or limits to the camera view.

4.5 Vehicle-mounted cameras

Operational cameras may be mounted on top of vehicles. These cameras are intended to function while the vehicle is stationary and used during situational responses to supplement the footage for the TOC.

This is not accepted as a design solution for operational visibility or part of the CoO.

The mounting should be secured to prevent the camera from changing position while the vehicle is moving and from being removed easily or stolen.

Vehicles will be required to provide cameras with their own power source and an appropriate communication method to allow the camera to be operated remotely.

4.6 Site assessment

Site assessments must be undertaken to consider:

i. required field of view and camera coverage area
ii. availability of required power and communication links to the site.

4.7 Site audit

A site audit must be undertaken to affirm the intent of the CoO.

Consideration should be given to any scheduled or existing planting.

5 DESIGN FOR SAFETY

This section defines the requirements to ensure the intelligent transport system can be operated and serviced safely.

5.1 Health and safety

All ITS equipment must be designed to ensure installation and maintenance in accordance with the Health and Safety at Work Act 2015 and the designer is to use a Safe System approach.

5.1.1 Health and safety in design

Health and safety in design must be undertaken to identify any hazards and the appropriate interventions.

See the latest version of the Waka Kotahi Health and Safety in Design Minimum Standard (ZH/MS/01).

5.2 Safety outcomes

5.2.1 Space to ensure safety conformance

Health and safety in design must be undertaken to determine the appropriate space required to operate safely within the CCTV site. The space must accommodate the CCTV pole, a cabinet, safety interventions (such as barrier protection if required) and allow further distance to the edge of the live lane depending on the speed environment.

A site safety assessment must be undertaken to determine the appropriate safety interventions.

5.2.1.1 Hinge folding pole consideration

Additional space is required for hinge folding poles. Hinge folding poles shall be aligned and located to swing down parallel to, and clear of, any carriageway. It should also clear the site roadside control cabinet or any other obstructions.

5.2.2 Site access

The site must allow reasonable vehicle access for installation, and for reactive and routine maintenance. The site shall be accessible, and the CCTV camera maintainable, without the need for temporary traffic management (TTM). The design should:

i. allow safe access to the site for maintenance vehicles
ii. minimise the exposure to hazards posed between maintenance vehicles and personnel, and traffic in the live lane(s)
iii. facilitate effective traffic control for any maintenance work above the carriageway.

5.2.3 Parking

To provide a safe parking location, sufficient space for manoeuvring should be provided. For reversing vehicles, rubber wheel stops should be installed where there is a risk of a vehicle hitting a pole, cabinet or other assets.

5.2.4 Safety issues – above and below ground

For safe distances from low and high-voltage power lines, refer to the latest version of the Transpower New Zealand Electrical Code of Practice for Electrical Safe Distances (NZECP 34).

The camera should not be located directly under or above any power lines.

Note that a check must also be made, using a Scala penetrometer, for the presence of underground services before digging or testing.

5.2.5 Electrical safety

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

5.2.6 Surge/lightning protection

Where a camera is located at the highest point on a structure, the contractor must provide a surge/lightning protection system in accordance with AS/NZS 1768:2007 Lightning protection.

The surge/lightning protection system shall consist of:

i. an air termination to intercept lightning discharges directly
ii. down conductors to connect the air terminal to earth terminals. Note that it is possible that these down conductors can be formed from reinforcing steel that are used as concrete support structures (as applicable)
iii. earth terminations to discharge the lightning currents into the general mass of earth. Note that this may in part, or in full, consist of the foundations for the support structure, depending on the calculated required maximum earthing resistance
iv. equipotential bonding between the lightning earthing system and any other earthing systems for personal and equipment protection
v. provision of point-of-entry protection at the distribution board in each control cabinet and protection to at least 45kA (8/20μs or 10/350μs). Minimum 10mm^2 green copper conductors shall be used for the connections. Leads shall be as short as possible to prevent inductive voltage differentials.

Multi-stage surge diversion shall also be provided on the incoming power circuits and communication circuits.

Surge diverters shall be field replaceable without the need to disconnect wiring and have integral indicators to show when they have blown.

5.3 Site assessment

A site assessment must be undertaken to consider:

i. safe maintenance access to the site (without the need for TTM) and safe maintenance access within the site
ii. site safety regarding passing traffic.

5.4 Site audit

A site audit must be undertaken to ensure the site is both safe to operate and safe to maintain.

5.5 System-specific safety requirements

Before any work is undertaken, cameras must be isolated from power appropriately.

6 DESIGN FOR MAINTAINABILITY

This section defines the requirements to ensure the intelligent transport system can be maintained.

6.1 Maintenance outcomes

6.1.1 Extreme weather or other environmental conditions

Avoid sites prone to flooding where possible. Consideration must be given to extreme or unusual conditions at each site that will require upgrading as part of the design.

Obvious examples include:

i. extreme winds that are more likely at >500m altitude, on a ridge or cutting, or in a lee effect multiplier zone, affecting foundations and pole design
ii. corrosive environments requiring enhanced coating systems, such as near coastlines.

Other less obvious examples include:

iii. the need to protect exposed equipment in alpine locations from wildlife
iv. avoid placing cameras under or near trees as this can attract spiders, ants or birds etc.

These should be integrated as part of section 5.1.1 Health and safety in design.

6.1.2 Asset labels

All assets are to be labelled to the satisfaction of the local WK Asset Manager.

6.1.3 As-built documentation

As-built drawings shall be supplied by camera vendors and contractors and will include (as required):

i. site layout drawing and schematic
ii. GPS coordinates of site
iii. pole structure
iv. installation elevations/plans
v. cabinet drawings and schematic
vi. power supply arrangements
vii. electrical compliance certificates
viii. camera make, model, firmware version and date installed

6.1.4 Camera pole inspection and maintenance

6.1.4.1 Inspection

Inspection of camera poles or brackets/mast arms shall be undertaken in accordance with Waka Kotahi policies, specifications and guidelines, including any manufacturer recommendations. This should include inspections of any earthing rods.

6.1.4.2 Maintenance

Maintenance shall be undertaken where necessary at scheduled inspections.

Reactive maintenance shall be undertaken following the identification of defects, in accordance with Waka Kotahi requirements.

7 DESIGN FOR SECURITY

This section defines the requirements to ensure the intelligent transport system can be secured and maintain integrity.

7.1 Security outcomes

7.1.1 Camera security

7.1.1.1 WiFi and Bluetooth

WiFi and Bluetooth capability must be disabled.

7.1.1.2 Passwords

All passwords must be changed from their default.

Passwords must be at least 12 characters long and include lower case, upper case, numbers and special characters.

Passwords must not include any wording related to the device or usernames.

7.1.2 Pole security

All poles with an inspection hatch should be locked by either a key or a padlock with a key. Padlocks with an inbuilt combination lock are not permitted.

Hinge poles should be closed with both a bolt and a separate padlock with a key.

Consider a padlock bolt hole to prevent bolt cutters from being used to remove padlocks.

7.2 Camera Configuration

This section details how the camera should be configured securely when being installed.

Enable settings only after considering the CoO for the camera. This may include security protocols used for connectivity, management, monitoring, backup or data transfer.

7.2.1 Firmware/software update

The latest version of firmware and software must be installed on cameras.

7.2.2 Factory default reset

Prior to configuring a camera, a factory default reset must be undertaken in the first instance.

7.2.3 HTTPS and SSH protocols

Configure and use HTTPS and SSH. Disable insecure protocols such as HTTP or Telnet.

7.2.4 SNMP

If SNMP is used, then enable version SNMPv3.

Default SNMP settings must be disabled and default community strings deleted and not used i.e. public and private.

7.2.5 NTP

Cameras should be configured to use three NTP servers for time synchronisation.

7.2.6 Multicast

All multicast features must be disabled.

7.2.7 Discovery broadcast protocols

Disable discovery broadcast protocols, such as plug and play.

7.2.8 Camera phone home

Disable camera phone home functionality, such as cloud connect, management and automatic updates.

7.2.9 Logs

Cameras must have logging enabled for each instance when the camera is accessed for operations, monitoring, configuration/setting updates or to record faults.

Logs must be stored for at least 3 months on the camera.

7.2.10 Privacy zones

Privacy zones must be configured for all cameras, where identified by the site survey.

Operational cameras may require clearly viewing the carriageway/road shoulder and potentially land adjacent to the carriageway/road. This should be discussed with TOC prior to configuring.

Web cameras should only view the traffic conditions and all surrounding environments should be blurred or obscured by privacy zones.

7.2.11 Vendor security hardening

If a camera vendor has developed a security hardening guide, these measures should be considered and implemented where they do not conflict or contradict requirements in this standard.

8 REFERENCES

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

8.1 Industry standards

Standard number / name	Source	Licence type and conditions
AS/NZS 1158.1.1:2005 Lighting for roads and public spaces – Part 1.1: Vehicular traffic (Category V) lighting – Performance and design requirements	Standards NZ website	Available for purchase
AS/NZS 1768:2007 Lightning protection	Standards NZ website	Available for purchase
Electricity (Safety) Regulations 2010 (SR 2010/36)	NZ Legislation website	Publicly available
Health and Safety at Work Act 2015	NZ Legislation website	Publicly available
Transpower New Zealand Electrical Code of Practice for Electrical Safe Distances (NZECP 34)	Transpower website	Publicly available

8.2 Waka Kotahi standards, specifications and resources

8.2.1 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
ITS core requirements standard: Minimum requirements for ITS
ITS delivery specification: Closed-circuit television – OPS
ITS delivery specification: Closed-circuit television – WEB
ITS delivery specification: Roadside cabinets
ITS design standard: Civil and structural requirements

8.2.2 Resources

Document name / code	Waka Kotahi website link
Health and Safety in Design Minimum Standard (ZH/MS/01)	https://www.nzta.govt.nz/assets/resources/contractor-health-and-safety-expectations/ZHMS-01-Health-and-safety-in-design-minimum-standard.pdf

8.3 ITS standard drawings

See the Waka Kotahi website for the latest versions of the ITS standard drawings listed below.

Drawing number

9 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
5.2.3	Parking	To be determined	TBA
4.4.1	Freestanding pole, the following sentence only: All poles must provide a flange on which a camera can be installed.	Civil and structural requirements design standard	010 Civil infrastructure
4.4.4	Site acceptance testing	SAT test cases	03
4.4.5	User acceptance testing	UAT test cases	03
4.2.5	Communication to site	Communication standard	TBC
7.1.2	Pole Security	Security Standard	TBC

10 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	05/01/2018	Kevan Fleckney	Design Engineer, Waka Kotahi	First draft
0.2	26/06/2020	Final Word	Editorial services	Transferring the draft document to the latest ITS design standard template
0.3	09/11/2021	Gary Nates	Lead author, Beca Ltd	Draft for Waka Kotahi Expert Panel
0.4	07/12/2021	Final Word	Editorial services	Proofread latest version
0.5	16/03/2022	Gary Nates	Lead author, Beca Ltd	Draft response to Expert Panel workshop
0.6	05/04/2022	Final Word	Editorial services	Proofread latest version
0.7	12/04/2022	Gary Nates	Lead author, Beca Ltd	Response to Final Word comments
0.8	19/04/2022	Final Word	Editorial services	Further queries for author and ITS Working Group
0.9	06/05/2022	Gary Nates	Lead author, Beca Ltd	Response to Final Word comments
1.0	18/10/2022	Gary Nates	Lead author, Beca Ltd	Response to RCA and Security comments