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NZ TRANSPORT AGENCY

CABINETS

Intelligent transport systems (ITS) design standard

17 OCTOBER 2024
0.12

DOCUMENT STATUS: FINAL DRAFT

New Zealand Government

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More information
If you have further queries, contact the Intelligent Transport Systems Standards and Specifications (ITS S&S) team via email: itsspec@nzta.govt.nz

More information about ITS is available on the NZTA website at https://www.nzta.govt.nz/its

This document is available on the NZTA website at https://www.nzta.govt.nz/itsspecs

Template version
2.0, 02/02/2024

Contents

1 Overview

1.1 Purpose

The purpose of this design standard is to provide details on site selection, how to design a cabinet for installation, safety, maintenance, and security to ensure compliance with the Client's operational and asset management systems.

1.1.1 NZTA ITS class

011 Enclosures – Cabinet and similar used to house roadside equipment.
Class definitions

1.2 Scope

This section sets out the design requirements for the installation projects of the following cabinets:

i. ITS node cabinet – dual door
ii. standard ground-mounted cabinet
iii. small-footprint cabinet
iv. post-mounted cabinet.

Traffic signal cabinets are not covered by this standard. They are covered by the ITS design standard and delivery specification: *P43 Specification for traffic signals.*

Roadside control cabinets shall provide:

i. suitable housing for mounting, environmental protection, and security of roadside equipment
ii. adequate conditions – including a temperature-controlled environment – to ensure the correct operation of the roadside communications equipment installed inside that connect to the ITS edge devices
iii. secondary support services such as environmental monitoring and telemetry (eg temperature, humidity, and power metering, ability to remotely cycle power supplies)
iv. backbone support services for installation of roadside ITS equipment such as the physical communications interface to the ITS network by the fibre optic cable network.

Typical network node cabinets shall provide:

i. ITS fibre optic cable network ethernet communications node equipment
ii. emergency power by provision of UPS, as well as diverse connections for the ITS fibre network.

1.3 Operational

The intended operational requirements of this standard are to:

i. ensure the cabinet can reliably house the required backbone services and communication infrastructure required,
ii. provide an environmental housing to protect environmental impacts for the devices inside,

iii. ensure the cabinet is an appropriate size to support the equipment to be housed inside.

2 Designing for operation

This section defines the functionality required to achieve successful operation of the ITS equipment.

2.1 Site selection

2.1.1 Power availability

For details on designing new power supply connections and existing supply, please refer to the latest version of ITS core requirements specification: *General electrical requirements*.

For details on availability requirements, please refer to the section titled ‘Reliability and availability’ in the latest version of ITS core requirements standard: *General requirements*.

For obligations of power supply, please refer to the section titled ‘Power supply’ in the latest version of ITS core requirements standard: *Requirements for intelligent transport systems*.

2.1.2 Communication availability

For details about communications infrastructure and access, please refer to the section titled ‘Operational visibility’ in the latest version of ITS core requirements standard: *Requirements for intelligent transport systems*.

The section titled ‘Communications’ in ITS core requirements standard: *Requirements for intelligent transport systems* identifies mandatory actions for communication links in terms of reliability, efficiency and availability. This document shall be referred to. Reliable and efficient communication links are required for Client network operators. This applies even if the corridor is operated by an external party.

2.1.3 Environmental conditions

Cabinets shall be installed in alignment with ITS core requirements specification: *Environmental requirements.* For more details, refer to the latest version of the corresponding ITS delivery specification: *Cabinets*.

The Consultant shall consider the role and quality of both geotechnical drainage and surface drainage when designing the placement of the cabinet. . Issues such as ponding and run off as well as other environmental conditions shall be considered and managed to minimise the negative impact on the cabinet and internal equipment, as well as the conservation values of roadsides or adjacent downslope/downstream vegetation. Considering this, cabinets shall not be designed for placement in low lying areas, adjacent to swales or in tidal areas.

If there is a medium-high likelihood/probability of flooding taking place and the cabinet cannot be located elsewhere or on a gantry, the cabinet shall be designed with a plinth area that prevents flooding from entering the cabinet.

2.2 Cabinet site design

For Consultants' reference, electrical wiring/switchboard parts of the cabinet shall be installed by electrical technicians who shall provide AS/NZS 3000:2018 *Electrical installations – Known as the Australian/New Zealand Wiring Rules* (AS/NZS 3000:2018) certification.

2.2.1 Positioning

2.2.1.1 General principles

In general, roadside cabinets shall be placed at required locations within the road reserve so the required electrical and communication services for roadside equipment and edge devices can be contained and readily accessed for planned and reactive maintenance.

Existing or new cabinets shall be placed in an area that:

i. minimises road safety hazards,
ii. minimises:
   - damage or disruption to infrastructure on roads
   - disruption to future development of road and non-road infrastructure
   - disruption to traffic
   - disruption to the effective and efficient delivery of utility services
   - cost to the community of infrastructure and services
iii. makes efficient use of resources of road agencies and infrastructure managers,
iv. considers all other available routing options (particularly in the vicinity of, or on, bridges),
v. minimises damage to trees (including their root systems and remnant vegetation) along the street, and high conservation value roadside areas,
vi. avoids the use of temporary traffic management (TTM) to access the roadside cabinet for maintenance and is, therefore, readily accessible and safe for maintenance purposes. This allows maintenance vehicles to be parked such that technicians can safely walk to the equipment (preferably a parking bay or a barrier)
vii. minimises maintenance activities,
viii. optimises the requirements of other ITS assets and cabinets that serve the same area of interest,
ix. is located on the same roadside direction to the assets the cabinets serve (eg near gantry access points or closed-circuit television (CCTV) poles),
x. minimises the risk of vandalism, theft, or graffiti (such as people climbing onto the cabinets to tag ITS equipment),
xi. allows working space for technicians with doors open,
xii. When locating the plinth, it shall not interfere with existing subsurface drainage assets.

The cabinet shall be orientated so that the personnel working at the front of the cabinet are facing oncoming traffic and so that doors can be fully opened without obstruction. The front of the cabinet is defined as the door behind which the control facia of internal equipment is accessible.

Where possible, the position of the cabinet shall also consider where street lighting exists. This is for workers' visibility and safety on the road and access to the cabinet.

2.2.1.2 For particular road classifications

Scheme drawings that decide cabinet positioning need to be aligned with the section titled 'ITS requirements for each road classification' in ITS core requirements standard: *Requirements for intelligent transport systems*.

2.2.2 Mounting

The cabinet shall be designed with a plinth and a gas plate above. The plinth shall be designed to provide safe and secure access for maintenance and other activities. This shall consider the environment the cabinet is being installed in and safety-in-design principles.

Consultants shall allow space for doors, including for the opening of doors and subsequent access to the cabinet.

Where a gantry spans both carriageways, all gantry-mounted ITS assets shall be designed to connect with equipment located on the same side of the road as the transmission system cabling and access point to the gantry. The design of roadside cabinets on gantries shall be avoided where practicable.

2.2.3 Support

Attachment of supports to concrete foundations shall be designed with power driven or 'Chemset' (hot dipped galvanised bolts with a minimum size of M12) studs as required, to provide structural stability. Attachments to masonry shall be using Dynabolts.

2.3 Cabinet Equipment functional requirements

As part of the design process, it is essential that the designer establishes all equipment that will be housed in the cabinet and develop a schematic layout of how this equipment should be connected for both power and communications. This design drawing is a prerequisite required before procurement of a specific cabinet type can take place

Typical equipment is listed in Section 6.1.1 Definition. All equipment must be defined and designed for, because different equipment types will guide cabinet type and installation.

2.3.1 Power

All cabinets shall be designed to include an appropriate fault current limiter, main switch, surge diverter and main distribution board.

The fault current limiter, main switch, switchboard, submains and wiring shall strictly comply with all relevant requirements of AS/NZS 3000:2018.

The main switch shall control the supply to all circuit breakers in the distribution board, but shall not control supply to the fault current limiter. When switched on, the main switch shall also be connected to the surge diverter. The main switch shall be appropriately rated.

A total of no less than six circuit breakers shall be provided, including the provision of necessary spare terminals on the earth link and neutral link(s), as follows:

i. An 'Auxiliary' circuit breaker, rated at 10A with a breaking capacity of not less than 8kA, shall be provided for controlling the socket outlets and any auxiliary circuits.
ii. A 'Logic/Equipment 1' circuit breaker, rated at not greater than 10A with a breaking capacity not less than 8kA, shall be provided to supply low-power equipment in the housing (such as the controller of the main traffic and transport related equipment on site).
iii. Four 'Equipment' circuit breakers (identified as 'Equipment CB2', 'Equipment CB3', etc), rated at not greater than 10A with a breaking capacity of not less than 8kA, shall be provided to supply other equipment inside the cabinet.

The design must also include an Uninterruptible Power Supply (UPS). The UPS shall provide power to the cabinet system and any other components that are necessary to maintain communication with the advanced traffic management system (ATMS). The UPS shall be an online type and shall provide a no-break transfer to battery-backed power in the event of mains power failure.

The UPS shall provide power to the cabinet system and any other components that are necessary to maintain communication with the advanced traffic management system (ATMS). The UPS shall be an online type and shall provide a no-break transfer to battery-backed power in the event of mains power failure.

The data wire between the UPS and the ITS will monitor three outputs of the UPS, as detailed in section 4.6.3 'Contact outputs' in AS 5715:2015 *Uninterruptible power systems (UPS) for roadside devices*. These outputs are:

- mains failure
- UPS fault
- battery at <60% remaining capacity (this will also require configuration in the UPS).

Batteries for the UPS shall be lithium ion, for their longer life expectancy. The UPS shall have a life expectancy of a minimum of 10 years and the batteries shall have a life expectancy of a minimum of 3 years.

The UPS shall have a network port which will support any communications module installed to allow access via the web interface of the UPS. This will provide performance and maintenance support activities.

A bypass switch shall be provided to enable the UPS to be either:

- switched into circuit
- switched out of circuit
- disconnected from the mains power supply to test the UPS.

An isolation switch is required for the UPS. The isolation switch type shall be rotary switches with a lock out facility. A suitable isolator fuse must be installed in the UPS cabinet between the incoming mains supply and the mains switch.

2.3.2 Communications

For the ITS equipment to function, there shall be internal and external cabinet design provisions for the optical fibre interface. If an optical fibre connection is not achievable, then a non-fibre optical solution shall be considered for communications, including the use of any external antennas for adequate system functionality.

Refer to the latest version of ITS design standard: *Optical fibre*.

Where the telecommunications service provider's (TSP) communications network design requires the use of third-party communications services at the roadside, the physical interface between the third-party provider's cable infrastructure and the TSP's cable infrastructure shall be housed in the node cabinet.

Advice on cabinet requirements can be obtained from the TSP such that the enclosure, access and maintenance needs of the third-party provider and the TSP are both satisfactorily accommodated.

2.4 Cabinet numbering

2.4.1 Roadside control and network node cabinets

Refer to the section titled 'Roadside control and network node cabinets' in the latest version of ITS core requirements standard: *General requirements*.

There is an additional series of numbers for cabinets on state highways. The number shall be Equipment – State Highway – Cab ID or series – Direction. Each cabinet shall be individually identified and numbered as part of the design process.

2.4.2 Name plate

Cabinets shall be designed with name plates. The name shall be designed based on the ITS numbering system (refer to the section titled 'ITS site and field equipment numbering' in ITS core requirements standard: *General requirements*).

2.5 ITS network change control

All changes for submission and approvals must strictly adhere to NZTA Change Process.

The Transport Operations Centre (TOC) Request for Change (RFC) template contains all information in relation to the change approvers and details as required by the Client. Refer to the NZTA Change Process document for the suitable procedure.

One of the following two key processes is applicable based on specific circumstances:

i. **Informational change** – Any change of ITS devices without performance impact must go through the NZTA Change Management Team only.
ii. **Operational change** – Any change of ITS devices that affects the ability to manage the state highway network operation must go through the Client in conjunction with the Technical Change Approval Board (TCAB).

The Client's security team is to review any change request related to any ITS cabinet request.

2.5.1 Auckland regional changes

For the Auckland region, the Auckland Transport Operations Centre (ATOC) shall be consulted in conjunction with the RFC application.

2.5.2 Other regional changes

For other regions, the Wellington Transport Operations Centre (WTOC) shall be consulted in conjunction with the RFC application.

3 Designing for safety

This section defines the requirements to ensure the ITS can be operated and serviced safely.

3.1 Health and safety

All ITS equipment must be designed to ensure installation and maintenance can be carried out in accordance with the Health and Safety at Work Act 2015.

A safety-in-design process must be undertaken.

3.2 Electrical safety

All ITS equipment must comply with and be designed in accordance with the Electricity (Safety) Regulations 2010 (SR 2010/36), and AS/NZS 3000:2018.

3.3 Design Safety

The Client requires the design to allow the ITS asset to be operated and serviced safely:

i. Safety must be included and maintained within the design.
ii. Safe access for maintenance must be provided.

3.3.1 Accessibility

The site must allow reasonable vehicle access for installation of cabinets, and for future reactive and routine maintenance. The design shall minimise the exposure to hazards posed between maintenance, vehicles and personnel, and traffic in the live lane(s).

Sufficient space for manoeuvring and parking shall be provided. If this is not applicable, a safe location to stop shall be identified. For reversing vehicles, rubber wheel stops shall be installed for protecting the cabinet equipment.

The cabinet shall be in areas that are well lit, or staff accessing the cabinet shall be equipped with lights for safe access to and visibility of the cabinet.

3.3.2 Wiring

Design for a local electrical isolation point shall be identified, readily accessible, and have the capability to be locked off at the cabinet.

3.4 Site assessment

A site assessment must be undertaken to consider:

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

The site auditor shall be provided with evidence that the cabinet complies with this design standard and the ITS delivery specification: *Cabinets*. A copy of the site acceptance test shall be included within the cabinet.

3.5 Site audit

A site audit shall be undertaken to ensure the site is both safe to operate and safe to maintain, and meets the requirements of ITS delivery specification: *Cabinets*.

3.6 System-specific safety requirements

3.6.1 Power supply safety features

As per section 3.2 above, electrical systems need to be designed and installed in accordance with AS/NZS 3000:2018. The live terminals at the switchboard, all terminal blocks, all relays, all contactors, and all transformers shall be protected against unintentional contact.

3.6.2 Certification of use

Cabinets and contents are owned and operated by the Client. Access is to be granted by application by the respective ITS Asset Manager or controlling TOC in case of emergency.

4 Designing for maintainability

This section defines the requirements to ensure the ITS can be maintained.

4.1 Maintenance

For maintenance conditions and obligations, refer to the latest version of ITS core requirements standard: *Requirements for intelligent transport systems*.

4.1.1 Access

The cabinet shall be designed to allow for safe and efficient access to and from the cabinet for maintenance purposes.

Location shall be such that temporary traffic management is not required but is located for safe routine maintenance.

4.1.2 As-built drawings

As-built drawings shall be supplied by the Consultant and will include:

i. electrical schematics – circuit identification charts (as-builts) for all distribution boards with full circuit information, and identification in line with the drawings
ii. systems schematics – a chart showing the cabinet power source and route
iii. network design
iv. cabinet site layout
v. site acceptance test documentation
vi. site log book
vii. details for local boundary or isolation point (including installation control point (ICP) number and details).

These designs shall be provided in an editable format.

5 Designing for security

This section defines the requirements to ensure the ITS can be secured and maintain integrity.

5.1 Security

Cabinets are used in various locations and conditions, and therefore specific consideration for application shall be considered to prevent:

i. removal of the complete unit from the site
ii. dismantling of the equipment
iii. operation of the equipment
iv. any form of vandalism and tampering of cabinets.

For more information, refer to the latest version of the Physical Security document: *Backbone infrastructure standard*.

5.1.1 Security features

All ITS assets are to be tamper-proof. This can be achieved by using a collar to provide an extra level of security.

For information about the locking system, refer to the latest versions of ITS delivery specification: *Cabinets*, and the Physical Security document: *Access control standard – Electronic access control systems, keys & locks*.

Designing for security shall be considered by the Consultant, and shall include:

i. internal door hinges,
ii. three-point locking,
iii. door alarms,
iv. mounting,
v. locating the cabinet in an area that minimises its conspicuity.

5.1.2 Secure access

The following security-related measures must be considered for ITS asset physical access:

i. Assets are to only be accessible to approved users, maintainers and operators. All accesses and gates are to be locked.
ii. Access doors and panels are to be fitted with locks designed for outdoor conditions, with a Client-approved regional personal identification number (PIN) and, when used, regional identical keys to the specified locks.
iii. When the cabinet is opened, an alarm/notification (as per ITS delivery specification: *Cabinets*) shall alert cabinet monitors regarding unauthorised persons accessing the cabinet.

6 Appendix

6.1 Overview

This design standard supersedes ITS design standard: *Roadside cabinets* and provides requirements for, and is to be read in conjunction with, the latest version of the ITS delivery specification: *Cabinets*.

6.1.1 Definition

The purpose of a cabinet is to provide environmental protection of ITS equipment and backbone support services for power, communications, and telemetry rack, including GPS services for telemetry status monitoring.

The cabinets described in this design standard are enclosures complete with electricity supply, cabling facilities and mechanical supports for the accommodation and protection of traffic and transport related equipment which does not have its own standalone housing suitable for direct installation next to the road.

A typical roadside equipment cabinet and site shall contain:

iv. cabinet
v. foundation (plinth)
vi. entry and exit ducts
vii. power supply and distribution
viii. transformers/power supply unit
ix. network switch
x. network modem
xi. splice tray
xii. uninterruptable power supply (UPS)
xiii. roadside controller equipment
xiv. documentation.

7 References

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

7.1 Industry standards

Standard number/name
AS/NZS 3000:2018 Electrical installations – Known as the Australian/New Zealand Wiring Rules

7.2 NZTA standards, specifications and resources

7.2.1 Standards and specifications

See the NZTA website for the latest versions of the ITS S&S listed below.

Document name
ITS core requirements standard: General requirements
ITS core requirements standard: Requirements for intelligent transport systems
ITS design standard and delivery specification: P43 Specification for traffic signals
ITS core requirements specification: Environmental requirements
ITS core requirements specification: General electrical requirements
ITS delivery specification: Cabinets

7.2.2 Resources

Document name/code	NZTA website link
Physical Security document: Access control standard – Electronic access control systems, keys & locks (latest version)	Available on request from NZTA security team
Physical Security document: Backbone infrastructure standard (latest version)	Available on request from NZTA security team

7.3 Legislation

Name
Electricity (Safety) Regulations 2010 (SR 2010/36)
Health and Safety at Work Act 2015

7.4 Other resources

Name

8 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.
AS/NZS	Australian and New Zealand Standard
ATOC	Auckland Transport Operations Centre
CCTV	Closed-circuit television
ICP	Installation control point
ITS	Intelligent transport system(s)
NZTA	NZ Transport Agency Waka Kotahi
PIN	Personal identification number
RFC	Request for change
S&S	Standards and specifications
TOC	Transport operations centre
TCAB	Technical Change Approval Board
TTM	Temporary traffic management
UPS	Uninterruptable power supply
WTOC	Wellington Transport Operations Centre

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

10 Document control

10.1 Document information

Document number	ITS-STND-CAB-202410
Previous document number/s (if applicable)	ITS-02-04
Document status DRAFT | FINAL DRAFT | RATIFIED | RETIRED	FINAL DRAFT
[IF RETIRED] New document details	
Online ISBN	
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/

10.2 Document owner

Role ITS S&S Steering Committee

Organisation NZTA

10.3 Document approvers

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

Approval date	Approver	Role	Organisation
DD/MM/YYYY			

10.4 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	23/02/2024	Mark Gregory Allan Arora Alyssa Greaney	Senior Principal Transport Engineer Transport Planner	Initial Drafts for expert panel
0.2	15/04/2024	Mark Gregory Allan Arora Alyssa Greaney	Senior Principal Transport Engineer Transport Planner	Draft for expert panel
0.3	10/05/2024	Mark Gregory Alex Lumsdon Allan Arora Alyssa Greaney	Senior Principal Associate Transport Engineer Transport Engineer Transport Planner	After expert panel and for industry consultation
0.4	12/06/2024	Mark Gregory Alyssa Greaney	Senior Principal Transport Planner	Third Draft – for proofer
0.5	17/06/2024	Matthew Bauer	Editor, Clear Edit NZ	Copyedit
0.6	19/06/2024	Mark Gregory Allan Arora Alyssa Greaney	Senior Principal Transport Engineer Transport Planner	Fourth Draft – amending proofer comments
0.7	19/06/2024	Matthew Bauer	Editor, Clear Edit NZ	Clean copy for TSC and ratification submission
0.8	5/07/2024	James Ellison Allan Arora Alyssa Greaney	Principal Transport Engineer Transport Engineer Transport Planner	After TSC feedback and prior to ratification
0.9	18/07/2024	James Ellison Alex Lumsdon Catherine Rochford	Principal Transport Engineer Associate - Transport Engineer Senior Associate – Project Manager	After TSC feedback and prior to ratification
0.10	26/07/2024	James Ellison Alex Lumsdon	Principal Transport Engineer Associate - Transport Engineer	After TSC feedback and prior to ratification

Version	Date	Author	Role and organisation	Reason
		Catherine Rochford	Senior Associate – Project Manager	
0.11	31/07/2024	James Ellison Alex Lumsdon Alyssa Greaney	Principal Transport Engineer Associate - Transport Engineer Transport Planner	Updates prior to ratification
0.12	17/10/2024	Alex Lumsdon James Ellison	Associate - Transport Engineer Principal Transport Engineer	Proofing check for ratification