WAKA KOTAHI
NZ TRANSPORT AGENCY

ACTIVE WARNING AND REGULATORY SIGNS

Intelligent Transport Systems (ITS) Delivery Specification

DOCUMENT STATUS: APPROVED
DOCUMENT NUMBER: ITS-SPEC-AWRS-202402

21 FEBRUARY 2024
VERSION 1.0

New Zealand Government

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More information
This delivery specification is to be read in conjunction with the Notes to AWRS Delivery Specification.
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

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1 OVERVIEW AND OUTCOMES

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

1.1 Purpose

This document specifies the requirements for electronic active warning and regulatory signs (AWRS), and the system integration requirements (such as protocols, interfaces, data standards etc) to ensure compliance with the Client systems and standards.

1.2 Scope

This delivery specification covers AWRS, including but not limited to:

i. speed indicator devices (SIDs)
ii. curve warning signs
iii. cycle warning signs
iv. kura/school zones – active warning signs
v. kura/school variable speed limit signs
vi. intersection speed zone (ISZ) variable speed limit signs
vii. slippery surface warning signs
viii. truck warning signs
ix. livestock warning signs
x. pedestrian warning signs
xi. equestrian warning signs.

NZTA ITS class: 001 Signs. Equipment which provides visual messages or warnings to users of the transport network. Class definitions

1.3 Outcomes

AWRS must:

i. help provide a safer environment for road workers, drivers, road users using other modes of transport, and pedestrians
ii. help increase road user acceptance of the information by improving the quality, operation and standardisation of information and images on all AWRS types
iii. help improve safety by providing hazard warnings to road users in advance of hazards and with enough time for a user to respond
iv. assist in improving utility of assets by capturing traffic data for analysis and compliance activities by developing a standard system to capture and report data.

2 FUNCTIONAL REQUIREMENTS

This section outlines what the equipment and systems need to do, and how they need to do it.

2.1 AWRS Unit

2.1.1 Variable speed limit signs (R1-2.1)

Variable speed limit signs (R1-2.1), as described in the TCD Rule, shall meet the requirements of option B, ie flashing roundel with no flashing lights in the corners (see **Error! Reference source not found.**).

The roundel must consist of three rings of LEDs. When activated, the outer ring must be continuously lit, but the inner rings shall flash at 1Hz cycle (0.5 second display).

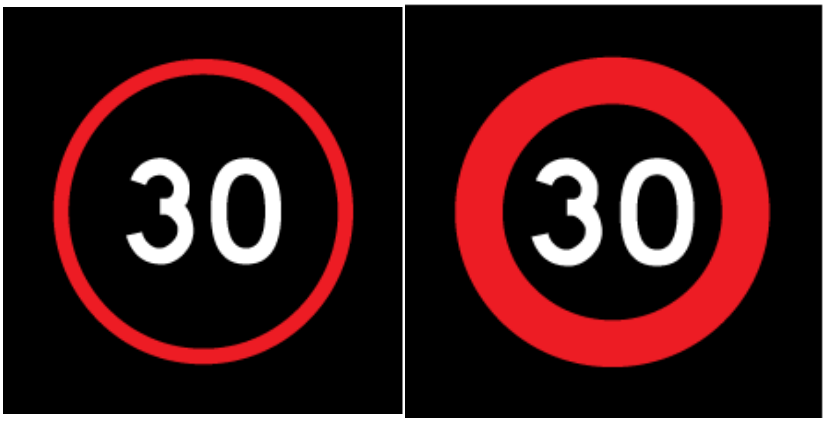

Figure 1. Example variable speed limit sign shown with flashing roundel

Signs must be able to be configured either locally or remotely to modify displayed speed limit.

2.1.2 Speed indicator devices (SIDs)

SIDs must measure a vehicle's speed and display the recorded speed to the approaching motorist. Dimensions of a SID shall be consistent with Table 1.

Location of a SID shall be installed at changes in speed thresholds.

Figure 2. Typical SID

Category	Dimension (mm)
Display dimensions (rectangle)	700 wide × 1000 high
Numeral height	400 minimum (fixed 88 pattern acceptable)
Numeral colour	Amber LED
Font height (SLOW DOWN)	160 minimum
Font colour (SLOW DOWN)	White LED
Pixel pitch (all LEDs)	16 maximum

Table 1. Display parameters for SIDs

2.1.3 Other AWRS

All aspects of other AWRS types (including font, legend, dimensions, colours and operations) must comply with the TCD Rule.

2.2 Sign aspect activation

An AWRS must incorporate a trigger mechanism to activate the aspect when a defined parameter is met or at a pre-defined scheduled time. The trigger mechanism may be integrated internal (eg radar) or external (eg loops, cameras, thermal imaging, third party communication and control device).

2.2.1 Radar

All AWRS where the radar is used as the primary activation mechanism must have the ability to mount a radar internally which will activate the aspect of the sign based on vehicle approach and/or speed.

The radar shall be activated by approaching vehicles only, with the primary function of the radar to trigger the sign aspect. Some data capture from the radar will be required – refer to section 2.4 Status reporting.

Individual vehicle tracking capability and vehicle-by-vehicle statistics are not required; however, contractor shall be required to supply a radar with this capacity at time of procurement for sites where the client requires the data.

The radar shall have the ability to operate in all weather conditions.

The radar upper and lower activation thresholds will be able to be configured either locally or remotely. If remotely, Contractor will supply any tools or software required to the Client for maintenance purposes.

The radar shall have the ability to be adjustable, either electronically or physically to meet the operating environment and to ensure the sign aspect is triggered at the required distance and/or speed.

Once a vehicle enters the radar field, the radar must be consistently capable of registering the speed of the vehicle and updating the display aspect when the AWRS is providing driver speed feedback as a SID.

2.2.1.1 Radar accuracy

Real-world applications of AWRS can be in complex environments which may affect radar accuracy. Additionally, testing in the field is difficult to achieve. Contractors will be required to declare radar accuracy at time of procurement. Refer to section 4.6 Documentation, software and licensing.

A speed display accuracy of ±1km/h is required.

2.2.1.2 Radar operation – display refresh rate

Radar must refresh the displayed speed no more than once per second.

2.2.2 Other external triggers

Where not activated by the internal radar, all AWRS aspects will have the ability to be activated by a variety of other external triggers.

Typical examples will be loops, cameras and thermal imaging sensors; however, some signs such as cycle and stock signs will require a button and a timer activated by a traffic signal button. Additionally, some activations may be weather related by rain gauge/sensor, temperature sensor or other gauges.

Regardless of the trigger mechanism, the AWRS will activate as a minimum via a closed-to-ground switch.

2.2.3 Third party communication and control device

All signs will also have the ability to be activated by the third party communication and control device to support remote user access and activation. These devices will hold and maintain the calendar for activation of AWRS such as kura/school variable speed limit signs.

2.3 Operation

A key requirement for each AWRS installation is the ability for remote communication for scheduled configuration uploads, data downloads, status transmission and performance monitoring. To enable this, all

AWRS must have the ability to connect to and communicate with a third party communication and control device located either within the enclosure or mounted on the same structure.

A third party communication and control device will be supplied by the Client.

AWRS must be designed in such a way that they can interact with multiple different communication and control devices. The signs must be agnostic of device type.

All third party communication and control devices will comply with the Client cyber security requirements.

2.3.1 Sign control

2.3.1.1 Supervisory control system

Requirements are detailed in Appendix A: Supervisory control system.

2.4 Status reporting

the Client intends to implement a system which allows control, performance monitoring and data extraction for each AWRS. Each AWRS must be able to communicate its internal state to the third party communication and control device when polled. Refer to section Appendix A: Supervisory control system for detail.

2.4.1 Reporting categories and parameters

Internal sign controllers do not need to permanently store logs or status information but may hold in a temporary register before being polled. The internal sign controller must be able to report the parameters/categories listed in Table 2. Status reporting categories to the third party communication and control device.

# Status	Category	Reporting	Sign response
1	Pixel status	Number of failed pixels	Report on polling
2	Temperature	Enclosure temperature	Report on polling
3	Photocell status	Normal/abnormal (on photocell fault)	Report on polling
4	Battery voltage	Voltage	Report on polling
5	System operating current	Amps	Report on polling
6	Door open/closed	Open/closed	Report on polling
7	Tilt alarm	Normal/abnormal (greater than 5 degrees off any axis)	Report on polling
8	Activation count (from the relevant digital input)	Count	Report on polling
9	Radar count	Count	Report on polling

Table 2. Status reporting categories

2.4.2 Radar data

Where radars are installed within the AWRS, the radar will connect with both the internal sign controller and the third party communication and control device. The radar will provide count numbers only to the internal sign controller for report on polling.

Additional information such as vehicle speed on activation, average speed over a set time and counts will be managed by the third party communication and control device.

2.5 Date and time control

All date and time control within the AWRS for activations via a stored calendar will be managed by the third party communication and control device.

2.6 Visual display matrix

2.6.1 Display uniformity

The AWRS must present a uniform and consistent aspect across the display matrix when activated for both luminous intensity (brightness) and colour.

2.6.2 Visible flicker

AWRS will have no visible flicker to the normal human eye at any light intensity/level. AWRS must also be machine readable, eg by sign recognition systems (including in-vehicle systems).

2.6.2.1 Frequency

In accordance with EN 12966:2014+A1:2018 *Road vertical signs – Variable message traffic signs* (EN 12966), section 4 Product characteristics, AWRS have a minimum frequency of 200Hz.

2.6.3 Display intensity and contrast ratio

AWRS shall be able to measure the ambient external light conditions and automatically adjust the intensity of the sign display. For the purposes of this delivery specification this will be referred to as a dimming system. The dimming system shall ensure that the intensity of the sign display is unaffected by short fluctuations in ambient light conditions and vehicle headlights.

The dimming system shall ensure that the luminance output of the sign is maintained in accordance with the ambient and background light conditions, including direct sunlight and darkness.

2.6.3.1 Light sensors

The dimming system shall:

i. be able to adjust the intensity of the display to a minimum of 10 different levels
ii. take average readings over a suitable and configurable (60s ±30s) period of time to modify the display intensity
iii. have a minimum of 1 light sensor per sign.

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 Resistance to the effects of external conditions

3.1.1 Design life

The specified design life (operational service life) of the AWRS equipment is 15 years. Equipment shall continue to operate effectively exposed to New Zealand weather conditions (as per National Institute of Water and Atmospheric Research (NIWA) climate data) for a minimum of 15 years. It is essential that materials and manufacturing processes take this into account.

AWRS shall be capable of continuous, normal operation (24 hours a day, 7 days a week) and maintaining performance criteria in the conditions described below:

i. installed and operated in direct sunlight
ii. ambient temperature range class T1 or T2 (as per EN 12966)
iii. enclosure air temperature between −10°C and +75°C
iv. maximum wind conditions likely to occur at the installation site as per AS/NZS 1170.2:2011 *Structural design actions – Part 2: Wind actions* (AS/NZS 1170)
v. solar radiation with a value of up to 2000W/m^2 at direct sunlight, incident at an angle of 30 degrees from the vertical
vi. humidity between 10% and 95% non-condensing
vii. conditions, both permanent and temporary, unique to the specified location, eg instances of thick smoke or electromagnetic interference
viii. marine environment
ix. road surface reflection.

3.2 Enclosure finish

The finish of all AWRS surfaces must not result in specular (mirror) reflection that distracts road users.

3.2.1 Enclosure surfaces

Enclosure surfaces (internal and external) must be powder-coated as per AS 4506-2005 *Metal finishing – Thermoset powder coatings* (AS 4506) for use in atmospheric classification D, which includes a minimum coating thickness of 60 microns over the pre-treated galvanised or aluminium sheet.

The colour of the display aspect is to be as per BS 4800:2011 *Colour chart* (matt black 00 E 53).

External enclosure surfaces must have an approved anti-graffiti coating applied.

The enclosure surface must not:

i. reflect light back to the user, to maintain contrast of the message being displayed
ii. use smooth, monolithic front screens (such as polycarbonate panels).

3.3 Mechanical

AWRS shall be designed to ensure reliable transfer of all static and dynamic forces to the fixing and mounting structures.

AWRS must meet class TBD6 as per EN 12966 for temporary bending deflection. See EN 12966 section titled Mechanical performance requirements.

3.3.1 Resistance of electrical/electronic components to the effects of pollution

The Contractor shall declare the degree of resistance in accordance with EN 12966 section titled Resistance of electrical/electronic components to the effects of pollution.

3.3.2 Resistance to surface corrosion

The surface protection of AWRS enclosures against corrosion shall meet the requirements of EN 12966 section titled Resistance to corrosion of discontinuous VMS.

3.3.3 Enclosure: ingress protection against water and dust

All AWRS enclosures must meet a minimum International Protection (IP) rating of IP56.

3.3.4 Vibration resistance

The AWRS shall be capable of withstanding vibration in accordance with table 19 of EN 12966 section titled Environmental and mechanical tests.

3.4 Visual performance

3.4.1 LED colour palette

When observing the whole AWRS display matrix from all viewing angles within the specified beam width, colours shall not be discernible as individual red, green and blue light sources.

3.4.2 Beam width

The LED elements for AWRS shall meet class B6 for EN 12966, ie have a minimum of 30 degrees total beam width. It is the designer's responsibility to select the correct beam width, and this shall be reflected in procurement documentation.

3.4.3 Colour

All AWRS must meet colour class C2 as per EN 12966. The chromaticity coordinates of the required colour parameters are defined in figure 1 of EN 12966 section titled Colour.

3.4.4 Luminance

All AWRS must meet luminance levels to class L3 as per tables 4 to 9 of EN 12966 section titled Luminance.

3.4.5 Luminance ratio

All AWRS must meet luminance ratio (LR) class R3 as per table 10 of EN 12966 section titled Luminance ratio.

3.4.6 Uniformity of luminous intensity

All AWRS must meet the requirements per EN 12966 section 4 Product characteristics, subsection titled Uniformity of luminous intensity.

3.4.7 Degradation of visual performance

AWRS design solutions must consider the impact to visual performance (ie colour, luminance and LR) caused by ageing effects. The visual performance requirements are minimum requirements and must be achieved during the entire operational lifetime of the AWRS (15 years).

3.5 Maintainability

AWRS shall be designed:

i. so that all the internal components can be easily and quickly replaced in the field
ii. to be installed and maintained by local technicians following the Contractor's supplied documentation
iii. to be easily accessed for maintenance
iv. to minimise onsite cyclic maintenance.

4 TECHNICAL REQUIREMENTS

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

4.1 Electrical safety

All ITS equipment must comply with and be installed in accordance with Electricity (Safety) Regulations 2010 (SR 2010/36) and AS/NZS 3000:2018 *Electrical installations – Known as the Australian/New Zealand Wiring Rules* (AS/NZS 3000).

4.1.1 Electrical equipment declaration of conformity

The Contractor shall supply a declaration of conformity for the AWRS in accordance with SR 2010/36, sections 80(2) and 81.

4.1.2 Installation of electrical equipment

The installer is required to supply a certificate to confirm the equipment has been installed correctly and is compliant with AS/NZS 3000. The Contractor who installs the equipment must provide the required certification. This includes acceptance of the declaration of conformity.

4.2 Electrical

4.2.1 Power supply – mains (including streetlight)

AWRS shall be powered by solar energy, however where a low voltage supply from a nearby mains supply is available, the AWRS shall be connected to this power supply in preference to a solar power supply, with agreement by the Client. Mains power must consist of 24-hour continuous supply or from a discontinuous streetlight circuit.

Variations in the nominal supply voltage of −13% to +10% shall not affect the sign functions.

Variations within the frequency range 50±1Hz shall have no effect on the operation of the sign.

4.2.2 Power supply – solar

The Contractor must be able to supply suitable solar panels, chargers and batteries with the AWRS when requested by the Client.

All batteries and solar charging regulator and associated equipment shall fit within the sign enclosure, unless approved by the Client

4.3 Internal sign controller

The controller must:

i. have the ability for firmware upgrade by the client either remotely or on site
ii. provide an interface to a communication device for the purposes of exchanging information, transmission of logs, alarms and configuration (refer to Appendix A: Supervisory control system).

Communication interface standard will be supplied by NZTA; please contact itsspec@nzta.govt.nz.

4.4 Physical characteristics

4.4.1 Front panels

AWRS front panels must be designed in such a way that no part of the message displayed is obscured when observed from the required viewing positions.

4.4.2 Front screens

Front screens adversely impact the intensity of light being transmitted from the AWRS and can be prone to degradation caused by weathering and exposure to intense direct sunlight. Consequently, monolithic screens such as polycarbonate panels or louvres are not permitted.

Signs must have a punched hole type face allowing for the aspect design or full matrix.

AWRS which allow portions of the front screen to be removed (modular) can risk weather tightness of the enclosure and are not permitted.

4.4.3 Doors and maintenance access

All covers, doors, plates, glands, external connectors etc shall be provided with rubber seals or equivalent materials which are maintenance free and shall remain effective for the design life of the equipment.

Access doors shall be fitted with a suitable retention stay or gas strut to hold the doors in the open position for the safety of maintenance personnel working inside the enclosure. They must include physical security against unauthorised access and have a door-open alarm capability to remotely report that any of the doors were opened.

For security, access doors and panels shall be fitted with one lockable latch per door or panel, designed for outside conditions. Other latches may be present for ingress protection but do not need to be lockable. Unless specified otherwise, all access door locks shall have an identical key, and the Contractor shall provide at least four copies of the key.

Maintenance access must be available without removing the sign from the post.

4.4.4 Cable entries

All power supply, control and communication cabling shall enter the AWRS enclosure through appropriately constructed, sealed and glanded entry holes in the base or rear of the sign.

In anticipation of mounting an antenna to support retrofitting of the supervisor on signs in the field, the sign Contractor shall fit a capped SubMiniature version A (SMA) bulkhead radio frequency (RF) connector, with tail, to the top surface of the sign with male thread and normal polarity. The tail must be long enough to reach anywhere inside the sign, terminated with a female SMA with normal polarity. The RF cable shall have an impedance of 50 ohms.

4.4.5 Electrolytic compatibility

Components shall comprise materials that when assembled into the AWRS are electrolytically compatible and environmentally stable.

4.4.6 Mounting to support structure

Unless otherwise agreed by the Client, signs shall be rear mounted on single, frangible pole. AWRS shall have a minimum of two mounting channels fixed horizontally to the enclosure. Larger signs may require 3 or 4 mounting channels for a secure mount to the pole or structure.

Mounting channels shall match standard New Zealand off-the-shelf brackets and connectors to facilitate installation.

Any penetrations into the enclosure shall have fully captive nuts so that the IP rating is not compromised. Modifications to AWRS enclosures are not permitted once they have left the place of manufacture.

4.4.7 Venting, heating and cooling

Signs will have no mechanical heating or cooling elements. The signs must be able to operate in all New Zealand weather conditions and seasons, operating within the stated temperature class T1 or T2 from EN 12966.

Signs will have no large venting apertures; however, pressure relief valves are acceptable. These must be installed so as to not affect the IP rating of the enclosure.

4.4.8 Labelling

All LED modules, signal controller boards and other similar serviceable parts shall have unique serial numbers permanently marked, which cannot be removed and shall not ever be modified.

4.5 Display matrix

4.5.1 Physical layout

The front display face must be of a punched hole type. Unless otherwise agreed by the Client, signs must be full front face matrix, incorporating the images, roundels and text or a full matrix used for the numeral text only.

Where the AWRS is required to display changing numerals (such as SIDs), the portion of the display used for the numerals must be formed using a regular matrix, ie the spacing between pixels in both the *x* and *y* axes is uniform.

Where the AWRS is required to display fixed numerals (such as ISZ AWRS or kura/school variable speed limit signs), the portion of the display used for the numerals must be formed using an irregular matrix which can display all numerals from 3 to 8 in the first position and 0 in the second position allowing the sign to display 30 to 80km/h.

The matrix shall be of sufficient size in order to display correct font shape and height for each AWRS type requirement.

4.5.2 Display technology options

LED technologies shall be the default choice for the active portion of the displays for all AWRS applications. This technology provides good visibility under most viewing conditions, high reliability and low optical degradation, and has low maintenance requirements.

4.5.3 Pixel pitch

The maximum pixel pitch for all applications will be 16mm for both full matrix images and roundels.

Where the signs display an image, the LED infill pattern must facilitate the display of smooth graphics which closely resemble the image required. Any image or red roundel must appear to be a continuously filled area rather than discrete points of light from the minimum reading distance (60m in urban areas). It is critical that the luminance and luminous intensity values specified are met or exceeded to meet these requirements.

If the sign is required to display a pulsing roundel, the roundel must be composed of three concentric rings of LEDs which, when all on, have an effective thickness of 90mm. As per the TCD Rule, the outer ring must be continuously illuminated while the other rings may flash or pulse with a frequency of 1Hz.

4.5.4 LEDs

Contractors are required to provide evidence that LEDs supplied as part of any AWRS meet the quality, luminous intensity ratings, batch requirements and life expectancy in this section and in section 3.1.1.

The Contractor shall provide details of the current rating of the proposed LEDs to be used, and what actual current they will be driven at to meet the luminous intensity requirements.

LEDs must be sourced from the same batch/bin in order to mitigate the risk of minor variations in colour output.

The latest high-quality manufacturing techniques must be used to ensure that:

i. exposure of components to mechanical or thermal stress is minimised
ii. manual handling of sensitive componentry is minimised
iii. conformal coatings are consistently applied to circuit boards to minimise exposure to condensation.

Modules forming the display shall be of a size that is easy to replace with the AWRS in situ in the field and without the need to dismantle any part of the AWRS. Pixels and/or pixel mounting blocks shall be modular and easy to swap/replace without requiring any soldering or any other form of heat-based bonding to other electrical components as part of the process.

4.5.5 Display legend

All AWRS shall display text and symbols that match the requirement of the current TCD Rule. This includes the symbols, sign layout, colours, beacons and operation that are detailed in Section 2.

4.5.6 Beacons

For signs required to have beacons as described in the TCD Rule, LEDs for the beacons must be arranged in a circular pattern of 90mm diameter, with infill pattern of LEDs at 16mm pitch maximum.

Beacons must flash when the sign is activated as described in the TCD Rule at a frequency of 1Hz (0.5 second display).

4.5.7 Rear indicators

All regulatory signs (variable speed limit signs, kura/school speed limit signs etc) shall have a 50mm diameter orange light on the rear of the enclosure which is on when the sign is activated. The light shall:

i. consist of a circular pattern of LEDs
ii. be readily visible in bright sunlight to 300m
iii. be shrouded to avoid light spill.

Other types must be supplied with rear indicators on request by the Client.

4.6 Documentation, software and licensing

4.6.1 Documentation

The Contractors must supply original equipment manufacturer (OEM) maintenance, service and operations guidelines and manuals, which will include maintenance schedules and procedures, handling and storage instructions, and a spares list.

Contractors must also supply product sheets for additional equipment within the AWRS such as radars. Prior to manufacture Contractor must supply shop drawings indicating all dimensions, display dimensions, mounting points and enclosure penetrations as a minimum.

4.6.2 Software and licensing

The Contractor must supply all software and licensing required to configure and manage the AWRS to the Client or its agent's use. Any software applications or tools required to manage the AWRS will be supplied with the asset when procured. Tools and software may include those required to:

i. configure the AWRS operational parameters such as radars and speed thresholds
ii. interrogate faults and logs and manipulate raw data
iii. update firmware.

4.6.3 Certification and declarations of conformity

All AWRS supplied to the Client must include a declaration of conformity from the Contractor to meet the performance requirements of this specification. Contractors must be able to supply factory quality control documentation on request, including but not limited to powder coating, LEDs, radars, IP rating and testing certification.

Independent certification of all performance parameters must be undertaken or supplied on request at time of procurement.

5 APPENDIX A: SUPERVISORY CONTROL SYSTEM

5.1 Purpose

The supervisory third party communication and control device is designed to supplement control, monitoring, and configuration functions of simple standalone autonomous field devices, such as AWRS. Further, this class of device typically has no communication requirement to deliver operational outcomes.

This application will provide an out-of-band ultra-light and retrofittable solution to overcome this and provide improved monitoring of the asset's status, and collection of traffic data from on-board detection devices, such as radar, installed in the AWRS.

The third party communication and control device will also provide the opportunity to enhance the current monitoring capability.

5.2 Base requirements

To facilitate the ability to retrofit a third party communication and control device, the following is required to be provisioned from the AWRS:

i. The sign must expose a supervisory control and monitoring interface that permits access to all sign control commands as well as interrogation of sign internal state or registers for the purpose of collecting environmental data, telemetry, warnings and faults.
ii. The electrical interface shall be RS-232 or RS-485 and support at least one (or more) of the interfaces, with the following serial settings (typical default settings in bold):
   - ELECTRICAL: **RS-232**, **RS-485**
   - BAUD RATE: **1200**, 2400, 4800, **9600**, 19200, 34800, 115200
   - PARITY: **None**, Even, Odd
   - STOP BITS: 0.5, **1**, 1.5, **2**.
iii. In the case of RS-232, the hardware shall only use TX, RX and GND. There shall be no hardware or software flow control methodology.
iv. The serial interface control and data exchange method must be documented and provided for the purposes of interfacing to the supervisor.
v. Documentation must include the packet framing methodology for data exchange. How packets are framed over the communication protocol is up to the Contractor, though it is recommended to use an industry standard framing methodology such as Modbus remote terminal unit (RTU) protocol.
vi. The packet framing methodology shall include a message integrity/error-checking sequence (eg cyclic redundancy check (CRC)).
vii. Documentation must include the command parameters and responses codes, including any timing diagrams for half-duplex communications.
viii. The communication protocol shall be stateless (ie, each command is atomic and fully self-contained; no command/control sequence has any dependency on any prior commands being issued).
ix. The sign shall act as a server/slave in all aspects of interactions via the supervisory communication port.
x. The sign shall not transmit any unsolicited messages via the communication interface once booted and stable (ie, it only responds to commands/queries; it does not publish a startup message when powered on).

xi. The physical termination of the communication interface shall be:
   - in the case of RS-232, a female DB9 connector or screw terminals
   - in the case of RS-485, a female RJ45 port (Contractor to specify pinout) or screw terminals.

xii. The communications port shall be easily accessible when the sign is fully installed, including supporting equipment such as batteries.

xiii. The sign shall expose a screw-terminal interface to allow the supervisory control system to be wired directly to the sign's power supply system prior to any load output switching on battery charging systems. The power supply shall provide:
   - a voltage of 9–24VDC
   - a max current of 2A
   - a base current of 150mA.

6 REFERENCES

This section lists references included in this document.

6.1 Industry standards

Standard number/name
AS 4506-2005 Metal finishing – Thermoset powder coatings
AS/NZS 1170.2:2011 Structural design actions – Part 2: Wind actions
AS/NZS 3000:2018 Electrical installations – Known as the Australian/New Zealand Wiring Rules
BS 4800:2011 Colour chart (matt black 00 E 53)
EN 12966:2014+A1:2018 Road vertical signs – Variable message traffic signs
IEC 60529:1989+AMD1:1999+AMD2:2013 CSV Degrees of protection provided by enclosures (IP Code)
RS-232 (ANSI EIA/TIA-232 1997) Interface between data terminal equipment and data circuit – Terminating equipment employing serial binary data interchange
RS-485 (ANSI/TIA/EIA-485-A 1998) Electrical characteristics of generators and receivers for use in balanced digital multipoint systems

6.2 NZTA standards, specifications and resources

6.2.1 Standards and specifications

See the NZTA website for the latest versions of the ITS standards and specifications.

6.2.2 NZTA Resources

Document name/code	Waka Kotahi website link
Land Transport Rule: Traffic Control Devices 2004 (TCD Rule)	https://www.nzta.govt.nz/resources/rules/traffic-control-devices-2004/
Traffic control devices manual (TCD manual)	https://www.nzta.govt.nz/resources/traffic-control-devices-manual/

6.3 Other resources

Name	Website link
NIWA climate data and activities	https://niwa.co.nz/education-and-training/schools/resources/climate
Electricity (Safety) Regulations 2010 (SR 2010/36)	https://www.legislation.govt.nz/regulation/public/2010/0036/latest/DLM2763501.html

6.4 ITS standard drawings

See the NZTA website for the latest versions of the ITS standard drawings.

7 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.
NZTA	This is noted as being equivalent to the New Zealand Transport Agency.
AS/NZS	Australian/New Zealand standard
Aspect	Front face of the sign as observed by road users when activated
AWRS	Active warning and regulatory sign(s)
CRC	Cyclic redundancy check
CSV	Comma-separated values
Display matrix	Visible part of an electronic sign which contains the pixels that can be activated to display the message
EN	European standard
Enclosure	Housing for electronics systems to protect against environmental conditions
FAT	Factory acceptance test
Hz	Hertz
IEC	International Electrotechnical Commission
IP	International Protection code (sometimes interpreted as Ingress Protection code) classifies the degree of protection provided by mechanical casings and electrical enclosures against intrusion, dust, accidental contact and water
ISZ	Intersection speed zone
ITS	Intelligent transport system(s)
km/h	Kilometres per hour
LED	Light-emitting diode
LR	Luminance ratio
NIWA	National Institute of Water and Atmospheric Research
m	Metres
mm	Millimetres
OEM	Original equipment manufacturer

Term	Definition
Pixel	Smallest controllable element of a display matrix for an electronic sign or signal
Pixel pitch	Distance between centres of adjacent pixels
RCA	Road controlling authority
RF	Radio frequency
RTU	Remote terminal unit
SAT	Site acceptance test
SID	Speed indicator device
SMA	SubMiniature version A
TCD manual	Traffic control devices manual
TCD Rule	Land Transport Rule: Traffic Control Devices 2004

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
3.1	Resistance to the effects of external conditions	Environmental core requirements standard	000 Core requirements
3.3	Mechanical	Environmental core requirements standard	000 Core requirements
4.1.2	Installation of electrical equipment	Electrical core requirements standard	000 Core requirements
4.2	Electrical	Electrical core requirements standard	000 Core requirements
4.36	Internal sign controller	Communications Standard	000 Core requirements
4.4.4	Cable entries	Electrical core requirements standard	000 Core requirements
4.4.5	Electrolytic compatibility	Environmental core requirements standard	000 Core requirements
Error! R eference source not found.	Testing and commissioning	Commissioning and handover core requirements standard	000 Core requirements
Appendix A	Supervisory control systems	Communications Standard	000 Core requirements

9 DOCUMENT CONTROL

9.1 Document information

Document number	ITS-SPEC-AWRS-202402
Previous document number/s (if applicable)	P32 Specification for Electronic Warning Signs on State Highways 16 March 2011
Document status	Approved
[IF RETIRED] New document details	
Online ISBN	978-1-99-106877-4
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/

9.2 Document owner

Role Head of Technology Engineering

Organisation NZTA

9.3 Document approvers

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

Approval date	Approver	Role	Organisation
12/06/2023	Endorsed by Technical Standards Committee	Technical Standards Committee	NZTA
21/02/2024	Approved by Ratification Group chair and NMPAS	Delegated approver	NZTA

9.4 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	10/06/2022	Richard Quiney and Mike Darnell	WSP	First draft
0.2	31/07/2022	Final Word	Editorial services	Proofread first draft
0.3	09/09/2022	Richard Quiney and Mike Darnell	WSP	Second Draft
0.4	14/09/2022	Richard Quiney and Mike Darnell	WSP	Third Draft
0.5	10/11/2022	Richard Quiney and Mike Darnell	WSP	4th Draft
0.6	20/12/2022	Richard Quiney and Mike Darnell	WSP	5th Draft for industry consultation
0.7	28/04/2023	Richard Quiney and Mike Darnell	WSP	6th Draft
0.8	28/04/2023	Anandita Pujara	Document Manager, NZTA	Updated purpose with target application of the document
0.9	02/05/2023	Matthew Bauer	Editor, Clear Edit NZ	Copyedit
0.10	05/05/2023	Matthew Bauer	Editor, Clear Edit NZ	Proofread
0.11	19/05/2023	Anandita Pujara	Document Manager, NZTA	Changes to terminology definition and purpose
0.12	6/06/2023	Anandita Pujara	Document Manager, NZTA	Updated section 6.5.5 - display legend
0.13	6/07/2023	Anandita Pujara	Document Manager, NZTA	Updated as per ratification group recommendation
0.14 0.15	15/01/2024 30/01/2024	Anandita Pujara John MacDonald	Document Manager, NZTA Lead Advisor, Asset Management, NZTA	Updated document to address further feedback received from the ratification group chair
1.0	20/02/2024	Anandita Pujara	Document Manager, NZTA	Approved version