WAKA KOTAHI
NZ TRANSPORT AGENCY

ACTIVE WARNING AND REGULATORY SIGNS

Intelligent Transport Systems (ITS) Design Standard

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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

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1 OVERVIEW AND OUTCOMES

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

1.1 Purpose

The purpose of this design standard is to specify the principal's requirements for the implementation of a range of electronic active warning and regulatory signs (AWRS) on the roading network by the Client. The target application of this document is SM031 and SM032 – State Highway construction and maintenance contract proforma manuals.

1.1.1 NZTA ITS class

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

1.2 Scope

This design standard provides guidance for the installation requirements for all AWRS types. Commonly installed AWRS include:

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.

This list is representative but not exhaustive. Designers need to consult the Land Transport Rule: Traffic Control Devices 2004 (TCD Rule) for a comprehensive list of approved aspects. Any new signs, or a different layout of a sign illustrated in this design standard, must have their word/font/symbol/light-emitting diode (LED) layouts approved by gazette notice or the TCD Rule. In the first instance, contact tcd@nzta.govt.nz.

These AWRS are denoted as R1-2.1 Variable speed (TCD Rule – Regulatory signs) or W19-2.1 Symbolic warning – active LED (TCD Rule – W19 General and symbolic signs).

1.3 Outcomes

1.3.1 Operational

By developing this design standard, NZTA is to achieve the following strategic outcomes specifically to ensure and enhance its dynamic hazard warning capability, including but not limited to:

i. providing a safer environment for road workers, drivers, road users using other modes of transport, and pedestrians
ii. increasing road user acceptance of the information by improving the quality, operation and standardisation of information and images on all AWRS types
iii. defining the ability for all AWRS to be remotely monitored, operated and updated by improving asset monitoring capabilities
iv. improving safety by providing hazard warnings to road users in advance of hazards and with enough time for a user to respond
v. improving whole-of-life ITS-related costs by supplying quality AWRS assets, including reducing the NZTA environmental footprint through reduced energy consumption
vi. improving utility of assets by capturing traffic data for analysis and compliance activities by developing a standard system to capture and report data.

2 DESIGN FOR OPERATION

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

2.1 Selection of AWRS as a solution

This design standard does not detail the method for initial site assessment and site selection which requires treatment via the application of AWRS, nor the choice of application for each site.

Guidance can be found in the NZTA *Speed management guide: Road to Zero edition* (July 2022) associated appendices and additional technical information.

Site and application type selection shall be undertaken with the assistance of The Client and/or the network outcomes contract and other stakeholders.

Designers must read the relevant NZTA traffic notes for each installation type in conjunction with this design standard where available. NZTA traffic notes are listed in section 7.2.2 Resources.

2.2 Sign visibility

AWRS must be positioned to the left of approaching motorists. In virtually all situations, it is considered unsafe to position a single AWRS on the right-hand side of approaching traffic because it can confuse motorists' point of reference under nighttime conditions and create potential crash hazards.

Signs may be gated with one on either side of the road at suitable locations with good nighttime visibility on agreement with the Regional Safety Engineer.

2.2.1 Clear sight distance

From the left of approaching motorists, AWRS must be visible from a clear sight distance of at least 2m for every km/h posted speed limit. This ratio will provide motorists driving at the legal speed limit with at least seven seconds to read the display, and those approaching at 50% above the legal speed limit with at least four seconds to read the display.

AWRS shall be positioned so that adjacent vegetation or structures will not obscure the visibility of the sign and that any vegetation clearance, including for solar panels, is completed and can be legally enforced for future maintenance.

2.3 Road environment

2.3.1 Road geometry

The section of road within the radar coverage of AWRS must be sufficiently straight to ensure the sideways vector will not cause the radar to underestimate the approach speed.

Ideally, avoid positioning AWRS directly in front of a rising or setting sun as this will significantly reduce effective visibility. Similarly, reflections of the sun on the display face can reduce legibility.

Where these display visibility factors cannot be mitigated (eg by taking advantage of a natural backdrop of a hill or trees, or a downhill slope) then the use of a hood, louvers or backing boards are required to shield the display. The designer must seek approval for any changes from the relevant regional or safety authority.

2.3.2 Presence of other signage

Signs or other large objects in front of AWRS can partially block the radar beam. AWRS must be positioned to minimise any such effects.

AWRS must not compete with existing signs, other light-emitting sources or interfere with traffic control devices (TCDs). The designer must make an inventory of all signs and TCDs both preceding and beyond the potential site. Based on this inventory, existing signs shall be removed to accommodate the placement of AWRS.

An assessment of existing signage must be undertaken to understand if modifications or removal of existing signage is required. In general, the minimum spacing distance between signs will be based on (0.6 × V85), where V85 is the 85th percentile speed of traffic, in km/h, at the sign location (NZTA *Manual of traffic signs and markings (MOTSAM) – Part 1: Traffic signs*).

2.3.3 Metal railings

Where AWRS incorporate a radar unit, metal railings such as bridge railings can partially shield the radar's beam and reduce its ability to register vehicles. The designer must take these effects into account when selecting a site.

2.4 General roadside location

2.4.1 Horizontal placement

AWRS are usually centrally mounted on a single frangible aluminium post. Where a larger solar panel is needed, or other conditions require it, there shall be two posts adjacent to each other, either side by side or front to back. Refer to section 2.5.2 Support structures for design requirements.

On a roadway with kerbing, the central post must be positioned at least 2m from the kerb face, and possibly more if the road has a pronounced camber, to ensure a high-sided vehicle will not clip the sign.

In urban environments or alongside footpaths, the sign position must in no way obstruct the established footpath width. However, the mounting height will allow for some aerial overhang of the footpath.

On roadways without kerbing, the central post must be positioned at least 3m from the edge line to ensure the roadside edge of AWRS cabinets are at least 2.5m from the edge line. AWRS must not protrude over the legal boundary (aerial trespass). A survey shall be required to establish the legal boundary.

2.5 Foundations and structures

2.5.1 Ground conditions and foundation design

Typically, each AWRS installation shall have a single-post support structure with a standard foundation design. Standard foundations are used for a specific set of ground conditions (bearing capacity, material type, ground water etc), wind loading and sign weight.

Ground conditions must be tested for each installation to assess whether the existing ground parameters fit within the standard design template. If ground conditions are unsuitable for the design envelope, a more robust foundation design must be developed.

Designers must refer to NZTA P24:2020 *Specification for permanent traffic signs* (NZTA P24), sections 5.5 Foundation design and 7.7 Foundations.

2.5.2 Support structures

There are a variety of support structure systems available. Designers must refer to NZTA P24 section 4.7 Sign support systems and appendix F for approved products.

Typically, AWRS are installed without guardrail protection and therefore will need to be installed on an approved frangible structure or with a breakaway base system. Designers must confirm all installations meet the frangibility guidelines. NZTA P24 section 5.8 Impact performance for sign supports provides design guidance.

Each support structure and foundation will be site specific. Designers must refer to NZTA P24 section 5 Design and appendices B & C to select a suitable structure for each installation.

Support structures must not prevent maintenance access to the AWRS.

2.5.3 Mounting brackets

There are a variety of bracket systems available but the most commonly used is aluminium channel type.

Designers must refer to NZTA P24 section 4 Compliance to select a suitable mounting bracket design for each AWRS type.

No additional penetrations are allowed through AWRS cabinets, so all bracket attachments must be installed by the Contractor or enclosed using sealed captive nuts.

Mounting brackets must not prevent maintenance access to the AWRS.

2.6 Mounting height

Minimum mounting height to the underside of the AWRS is 2.4m; however, it is recommended that signs are mounted at 3.0m to reduce vandalism.

The tops of AWRS (note the additional height of those with solar panels) must not be located within the minimum safe allowable distance for structures. Designers must also refer to NZECP 34:2000 *New Zealand Electrical Code of Practice for Electrical Safe Distances* (NZECP 34). Consultant to identify the separation distance from power companies. If it requires greater separation distances, then this must be established during site design. These distances can be reduced with site-specific engineering advice from the power company.

A note must be made if the site is under power lines low enough to interfere with erection of the support structure, and this information made available to the AWRS installer. When using relocatable AWRS, there must be adequate clearance to safely lift the support structure in and out of the foundation socket.

For solar-powered sites, the designer must also check that trees and/or the nearby topography will not unduly shade the solar panel throughout the sun's summer and winter arcs, and confirm that tree growth will not cause an issue in the future.

Designers must ensure that site topography such as road alignment, shoulder gradient and vegetation will allow the sign to be read and understood at the required sight distance. Visibility requirements of each installation will be determined by speed environment and sign type. Unless otherwise stated in this design standard, designers must aim for a minimum visibility distance of 2m per km/h of posted speed limit.

2.7 AWRS with associated static sign panels

Many AWRS types are mounted with static panels on the same pole or structure, such as kura/school variable speed limit signs and SIDs. Refer to Appendix A: Static panels for examples of typical AWRS and static panel integration.

Static panel materials design and manufacture must meet all NZTA P24 requirements.

Static panel layout design, fonts and colour must meet the NZTA *Traffic control devices manual* (TCD manual) sign specifications.

2.8 Power supply

The installer is required to supply a certificate to confirm the equipment has been installed correctly and is compliant with AS/NZS 3000:2018 *Electrical installations – known as the Australian/New Zealand Wiring Rules* (AS/NZS 3000). The electrician who installs the equipment must provide the required certification. This includes acceptance of the declaration of conformity.

2.8.1 Mains power

If readily available at the location and installation is cost effective, low-voltage mains power is the preferred option.Consultant shall request mains-supplied AWRS to be supplied with a battery backup system which can support sign operation in the event of a mains failure, usually with a 72-hour minimum requirement.

The power supply total underground distribution system (TUDS) must be located at a suitable distance from the base of the pole so that it will be unlikely to be impacted at the same time as the support pole.

All underground cabling type, location and depth as-built information must be collected and supplied to the road assessment and maintenance management (RAMM) database. As-built drawings will be required for all new underground services and must be approved by the RCA.

Electrical certification must be supplied as part of the site sign-off. Testing must also be provided to ensure the cables installed meet the volts/amps required for the installation.

2.8.2 Mains power – street light circuits

Low voltage power supply from nearby streetlight circuits can be used where there is no available 24/7 mains power. This system may result in a separate battery box installed on the pole structure. Any additional equipment on the pole will have to be taken into consideration when selecting the structure. Batteries must be securely fixed in place within enclosure or battery box.

2.8.3 Solar power

Solar power is commonly used in more regional areas or where mains power supply is prohibitively expensive. Where achievable, the preference is to mount all batteries within the sign enclosure. Batteries must be securely fixed in place within the enclosure. There will be installations which may result in a separate battery box installed on the pole structure. Any additional equipment on the pole will have to be taken into consideration when selecting the structure.

When sizing the solar panel and battery backup system, design consultant must take into consideration factors such as average sunlight hours per year, geographical location, potential shading, expected number of activations, typical power draw and the criticality of the AWRS. Often solar-powered sites will fail when the system has not been designed to suit the environment and frequency of activation.

2.8.4 Other power supplies

In the instance where some sites are not suitable for any of the usual power options, such as winter operation in high mountain areas, shading from trees or general topography. Where this occurs, other options for power supply such as wind turbines or fuel cell generators shall be considered.

Any additional long-term maintenance or recharging requirements must be taken into consideration and factored into the whole-of-life costs of the installation.

2.9 Communications coverage

All AWRS will be connected remotely to allow for data download and upload. The options must be assessed as far as possible on site with a suitable signal strength meter to determine location, particularly in rural areas with lower coverage.

A number of suppliers are able to provide low-bandwidth devices which can connect to a communication network. The Consultant will manage the communication connection to the sign.

2.10 Environmental impact and public consultation

The requirement to consult with nearby residents and businesses, particularly those within the LED illumination cone, must be considered in the instance where AWRS and their support structures are visually intrusive on the surrounding area.

Engineering judgement must be exercised and, if necessary, an alternative site selected.

2.11 Speed indicator devices

Designers must refer to *Traffic note 23: Speed indicator devices – guidelines* for additional information on positioning and operational procedures of a SID.

2.11.1 Positioning

SIDs must be positioned far enough away from a speed limit change sign to ensure motorists do not receive the message to slow down before they reach the speed limit change sign. Otherwise, this will challenge the credibility and reduce the effectiveness of the SID.

Where possible, SIDs must be sited:

i. at least 200m after the speed limit change sign
ii. around a corner or over the brow of a hill from the speed limit sign
iii. so that the radar can be aimed at a suitable point on the roadway for the road alignment, general traffic environment, and posted speed limit
iv. where the sight distance to the SID is at least 2m for each km/h of posted speed limit.

Avoid placing AWRS just after an intersection (no closer than 200m). Vehicles crossing the intersection will cause a zero-speed readout, potentially confusing other motorists approaching the sign.

2.11.2 Threshold settings

Activation threshold settings will be modifiable within the SID, but the following shall be the default settings:

i. The lower speed threshold will be set 20 km/h below the posted speed limit.
ii. When the speed of an approaching vehicle is below the lower threshold setting, the sign remains blank.
iii. When the lower speed threshold setting is exceeded, the sign will display the vehicle's speed.
iv. The upper speed threshold shall be set at not more than 10km/h above the posted speed limit. When the approaching vehicle's speed exceeds the upper threshold, the words SLOW DOWN will replace the speed or flash up if separate LED text is used.

2.12 Curve warning signs

2.12.1 Positioning

Curve AWRS have no fixed installation distance in advance of the curve as it is related to the upper speed threshold (refer to section 2.12.2 Threshold settings). Due to the variability of each site, engineering judgement will be required to locate AWRS in the optimum position. Designers must refer to TCD manual section 7.3 Location for guidance.

Curve warning AWRS are also typically installed at locations which will already have a static horizontal curve advisory sign installed in advance of the curve. It is generally better to retain the static warning sign as an advance warning and position AWRS closer to the curve. Under such situation, static sign shall be relocated during installation of AWRS.

For AWRS to be effective, motorists must not receive a SLOW DOWN message before they enter the desirable deceleration zone. AWRS and radar must be positioned so that the sign is not activated when the vehicle is more than 200m from the curve.

2.12.2 Threshold settings

Determining the lower and upper speed threshold setting requires a degree of engineering judgement. The main factors to consider include the:

i. distance from the curve to AWRS
ii. distance from AWRS to the point where approaching motorists will first see the electronic message
iii. differential between the 85th percentile approach speed and the advisory speed for the curve
iv. influence of uphill or downhill gradient on ability to decelerate safely
v. influence of poor climatic conditions on ability to decelerate safely.

Generally, the lower speed threshold setting will be the same as the advisory speed for the curve.

When the speed of an approaching vehicle is below the lower threshold setting, AWRS will remain blank.

When the lower speed threshold setting is exceeded, AWRS will display a curved arrow.

When the approaching vehicle's speed exceeds the upper threshold, AWRS will continue to display the arrow and, in addition, the message SLOW DOWN.

The upper speed threshold is the most challenging to determine and is dependent on the factors listed above. For typical high-risk curves it is reasonable to set the upper threshold 15–25km/h above the advisory speed for the curve, and adjust, if necessary, based on observations of driver behaviour and data from the sign radar or site testing.

If evidence suggests the upper threshold setting should be >25km/h above the advisory speed for the curve, or AWRS have been positioned too far away from the curve then consideration should be given to shortening the radar range or shifting the AWRS closer to the curve.

2.13 Cycle warning signs

2.13.1 Positioning

Cycle AWRS are usually located at narrow bridges or narrowing sections on state highways such as merge lanes, where there will already be a static cycle warning sign. The static sign must be relocated in advance of AWRS in order to locate AWRS closer to the bridge or hazard.

For a bridge, activation loops on the shoulder of the road will generally be adequate to trigger the sign. Other forms of activation such as radar, video or other RCA-approved device detection are also suitable. Loops must be configured to activate only on detection of a cyclist (eg below 50km/h), or there must be a clear separation between the vehicle traffic and cycle traffic.

For other applications – eg where cyclists are expected to cross an off-ramp, or sections of road where there is no safe cycle shoulder – cyclist hold rails with an activation button shall be considered, in addition to activation loops on the shoulder of the road. The activation button and hold rail must be located close enough to the crossing point to enable useful application for cyclists.

2.13.2 Activation loop positioning

The key considerations for placement of the induction loops and cycle AWRS are as follows:

i. The induction loop must be positioned far enough ahead of any pinch point forcing a cyclist into the traffic lane, or where a cyclist is required to cross an onramp to ensure motorists have time to react when a cyclist activates the sign.
ii. The electronic cycle sign must be placed after the induction loop so cyclists can see that the sign has been activated.

For guidance, in an 80–100km/h speed environment, the following are recommended:

i. On a flat or slightly uphill approach, induction loops will be approximately 40m ahead of the pinch point (typically, this allows the sign to warn motorists for 7 or 8 seconds before cyclists reach the pinch point). This distance can be reduced or extended for steep uphill or downhill approaches, respectively.
ii. There must be an obvious diamond pattern on the shoulder (usually the sealed-over cuts in the asphalt for the loops) to enable cyclists to see the location of the loops (refer to Land Transport Rule: Traffic Control Devices 2004 – Shared Path Behavioural and Cycle Detector Loop Road Markings M2-3F Cycle loop detection marking). Cycle AWRS must be positioned a minimum 30m after the induction loops.
iii. The clear sight distance for motorists approaching cycle AWRS must be consistent with section 2.2.1 Clear sight distance.

2.13.3 Time settings

As a general guideline, the length of the illumination period will be based on ensuring the majority (lower 15th percentile cut off) of cyclists will cross the bridge while the sign is illuminated. It is recommended to undertake site surveys to collect accurate data on cyclist speeds. If site-specific data is not available, designers are recommended to use a cyclist default speed for a flat bridge of 20km/h, which equates to approximately 5m/s.

2.14 Rural kura/school active warning

Designers must refer to NZTA *Traffic note 56 revision 1: Active school warning signs – guidelines* for guidance on positioning and operation.

2.15 Kura/school variable speed limit

Designers must refer to the *Speed management guide: Road to Zero edition* section titled Variable speed limits around schools for guidance on positioning and operation.

Signs must be the R1-6 LED Variable Kura/School speed limit type B option only.

2.16 Intersection speed zones (ISZ)

Designers must refer to NZTA *Traffic note 62: Intersection speed zones – guidelines and requirements* for guidance on positioning and operation of ISZs.

2.17 All other AWRS types

2.17.1 Positioning

Designers must refer to NZTA *Traffic note 57: Active warning signs (not at schools) – guidelines* for guidance on positioning and operation.

Positioning for other types will be site specific and will rely on engineering judgement. Key considerations shall include the following:

i. AWRS are to be located sufficiently in advance of the hazard to enable drivers enough time to take the required action.
ii. Radar activation shall occur at the required point for drivers to notice and take action – not too early or too late.
iii. Site distances shall be maintained.
Speed thresholds shall be assessed on a site-by-site basis, which affect AWRS positioning.

3 DESIGN 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 in accordance with the Health and Safety at Work Act 2015.

3.2 Safety outcomes

3.2.1 Site access design

All sites must allow reasonable access for installation and maintenance of AWRS. Due to the nature of these installations, the working areas are likely to be within 5m of the edge line, requiring some form of temporary traffic management (TTM). The designer must identify any unusual TTM requirements for all future activities. Designs shall eliminate the need for lane closures during maintenance.

Maintenance vehicles must be able to safely exit from the live lane and park a safe distance from the edge line. Sites must be designed so that maintenance vehicles can safely re-enter the live lane from the area of operation.

Designers are responsible for ensuring safe maintenance access to the site.

3.2.2 Working at heights

Most AWRS will be installed higher than 3.0m from the existing ground level and will require ladder access. AWRS must be installed on firm, flat ground. Designers shall incorporate a flat concrete pad or well compacted flat gravel hardstanding area on roadside shoulders and verges to facilitate safe ladder access for maintenance.

For construction, heavy maintenance and decommissioning, the site will facilitate the use of portable access equipment (eg scissor lift or cherry picker).

It is the designer's responsibility to ensure each site is safe for access. See the latest version of ITS core requirements standard: Commissioning and handover requirements.

3.2.3 Working near overhead powerlines

Designers must ensure maintenance access requirements for signs located under powerlines will not encroach on the safe exclusion zones around the powerlines. Designers must refer to NZECP 34.

3.2.4 Services

The tops of AWRS (note the additional height of those with solar panels) shall not be located any closer than 2m to overhead low-voltage power lines, and not closer than 4.5m for high-voltage lines. However, if any

power company require greater separation distances, then this must be established during site design. The local power distribution company will be consulted prior to installation and before approval to install is received.

Note must be made if the site is under power lines low enough to interfere with erection of the support structure, and this information must be made available to the AWRS installer. If the site is to have relocatable AWRS, there must be adequate clearance to safely lift the support structure in and out of the foundation socket.

No ground penetration shall be undertaken without an on-site service markup following a desktop investigation.

3.2.5 Site acceptance test

All AWRS installations shall undergo a full site acceptance test (SAT). SATs will vary with installation types. Part of each SAT will be an assessment for maintenance and operational safety. Installers will be required to supply an electrical certificate of compliance and a record of inspection if on mains power, prior to the SAT being undertaken.

3.3 Site assessment

Each proposed AWRS site should be assessed to consider, as a minimum:

i. Reasonable vehicle access for installation and maintenance.
ii. The ability for a maintenance vehicle to park in a suitable position to provide advance warning traffic management for inspections and minor maintenance of the asset, as per the current NZTA TTM requirements.
iii. The presence of overhead or underground power and other services.
iv. The site topography allows for safe access for technicians to all equipment, including flat ground adjacent to the pole to accommodate the use of ladders.
v. Any other risks / hazards such as being in a high wind zone or risk of flooding.

3.4 Site audit

It is the designer's responsibility to ensure each site has a post construction site audit undertaken to match the requirements of each installation type. See the latest version of ITS core requirements standard: Commissioning and handover requirements.

3.5 System-specific safety requirements

As all these signs are electrical installations, only appropriately trained electricians or technicians shall undertake work on these installations.

4 DESIGN FOR MAINTAINABILITY

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

4.1 Maintenance outcomes

4.1.1 Extreme weather or environmental conditions

Consideration must be given to extreme or unusual conditions that shall require part of the design to be upgraded. Extreme winds shall necessitate upgrading of foundations and structural support. This is more likely when the site is located above 500m altitude, on a ridge, in a cutting, or in a lee effect multiplier zone (refer to AS/NZS 1170.2.2021 *Structural design actions – Part 2: Wind actions* (AS/NZS 1170.2)).

Corrosive environments requiring enhanced coating systems, and the need to protect vulnerable components such as weather seals from native parrots in alpine locations, must also be considered. Consideration must also be given to ongoing maintenance requirements that are a result of these conditions.

4.1.2 Doors and maintenance access

All 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. Door seals are considered essential to protect against ingress of dust/insects and to meet the ingress requirements of EN 12966:2014+A1:2018 *Road vertical signs – Variable message traffic signs* (EN 12966). In addition, they shall form part of water and pollutant ingress protection systems.

4.1.3 AWRS structures and sign inspection and maintenance

Inspection of AWRS structures will be undertaken by the network Consultant or a dedicated ITS maintenance contractor. Generic maintenance activities will be developed between the client and the Contractor. Routine inspections shall be tasked to the contractor on a six-monthly basis (or a greater or lesser interval as required). AWRS structures are classified as ‘other structures’ within the RAMM database.

Inspection activities will include, but not be limited to:

vi. checking for damage (accident, or vandalism)
vii. ensuring the security of any power cable
viii. checking on the condition of the corrosion protection system
ix. checking and tightening of connections between the support structure, cabinet, and any solar panel, particularly the torque on approved bolted slip-bases
x. confirming the activation and operation of the display
xi. confirming the accuracy of display
xii. identifying any dim or dead LEDs
xiii. checking on weather tightness and security of cabinet
xiv. ensuring clear line of sight to the AWRS for motorists (removal of vegetation etc)
xv. confirming solar panel is not being significantly shaded throughout the sun’s winter and summer arcs
xvi. reviewing whole site for any safety issues
xvii. confirming correct radar activation and checking that radar is correctly measuring and reporting speed (particularly important for SIDs).

All installations will comply with AS/NZS 3000 electrical installation requirements. Where mains-powered AWRS are installed, test for:

i. earth loop impedance
ii. earth continuity
iii. circuit breaker operation.

Following the identification of defects, any required maintenance shall be undertaken by Contractor with the agreement of the client.

Preventative and emergency maintenance will be included with any purchase of AWRS. This shall be carried out for a limited time by the Contractor and then covered by other The Client maintenance contracts.

It is important that whoever is managing the procurement and installation includes a detailed handover process in the contract documents. Handover of asset maintenance will be to the relevant maintenance contractor responsible for that region.

Time frames and service level agreements (SLAs) – including such items as battery checking and replacement (the suggested default battery replacement interval is every three years), checking solar panel recharging, and running basic health checks on the electronics – will be negotiated with sign supllier as part of the procurement process.

4.1.4 As-built documentation

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

i. site layout
ii. support structures
iii. installation elevations/plans
iv. cabinet drawings
v. power-supply arrangements
vi. electrical compliance certificates
vii. RAMM data
viii. asset numbers/serial numbers.

5 DESIGN FOR SECURITY

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

5.1 Security outcomes

5.1.1 Physical security

Sign enclosures will have physical security against unauthorised access and a door alarm capable of remotely reporting on a door being opened. Doors will be fitted with a minimum of one lock per door panel.

Signs are recommended to be mounted at 3.0m from ground level to reduce vandalism and unauthorised access.

5.1.2 System/IT security

Third party control devices supplied to the client will comply with client cyber security requirements.

6 APPENDIX A: STATIC PANELS

Some AWRS will require static panels to be installed on the same poles/structures. Additional surface area for wind loading must be taken into account when choosing structure size.

The size of static panels will be determined by the posted speed limit.

6.1 Kura/school variable speed limit signs

Kura/school variable speed limit signs have a static panel WU22 mounted immediately underneath the AWRS, (see Figure 1. WU22 Kura/school static panel). For dimensions and details, refer to TCD manual: Sign specifications, rule W16-5.1 Permanent warning general supplementary non-motorised users kura/school.

Figure 1. WU22 Kura/school static panel

6.2 ISZ signs

Depending on the layout of the ISZ, AWRS will have a static panel mounted immediately underneath (see Figure 2. WJ2A Intersection layout static panel). Typically, it will be a 750mm WJ2A. For dimensions and details, refer to TCD manual: Sign specifications, rule W11-2 Intersection crossroads junction controlled priority route straight ahead.

Figure 2. WJ2A Intersection layout static panel

Other sign types will be used depending on intersection layout, such as WK5L (rule W11-4 Intersection side road junction controlled on left) and WXL1 (rule W15-1 Railway level crossing on controlled crossroad level crossing to the left). This will be determined on a case-by-case basis.

Where the posted speed limit is 100 km/h, all ISZ signs shall have a 750mm diameter RS2 mounted immediately under the AWRS on the reverse (see Figure 3. RS2 100km/h static panel). For dimensions and details, refer to TCD manual: Sign specifications, rule R1-1.1 Speed limit standard 100km/h.

Figure 3. RS2 100km/h static panel

Where the posted speed limit is 80 km/h, the signs will be replaced with R1-1 speed limit standard 80km/h signs.

6.3 SIDs

All SIDs will have a white reflective sign with black font and border, mounted immediately above the SID enclosure (see Figure 4. Your Speed static panel). Font will have a minimum 150mm character height.

Figure 4. Your Speed static panel

7 REFERENCES

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

7.1 Industry standards

Standard number/name
AS/NZS 1170.2:2021 Structural design actions – Part 2 Wind actions
AS/NZS 3000:2018 Electrical installations – Known as the Australian/New Zealand Wiring Rules
EN 12966:2014+A1:2018 Road vertical signs – Variable message traffic signs
NZECP 34:2000 New Zealand Electrical Code of Practice for Electrical Safe Distances

7.2 NZTA standards, specifications and resources

7.2.1 Standards and specifications

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

Document name
ITS core requirements standard: Commissioning and handover requirements
ITS delivery specification: Active warning and regulatory signs

7.2.2 Resources

Document name/code
Land Transport Rule: Traffic Control Devices 2004 (TCD Rule)
Manual of traffic signs and markings (MOTSAM) – Part 1: traffic signs
NZTA P24:2020 Specification for permanent traffic signs
Speed management guide: Road to Zero edition (appendices and additional technical information)
Traffic control devices manual: Sign specifications
Traffic note 23: Speed indicator devices – guidelines
Traffic note 56 revision 1: Active school warning signs – guidelines
Traffic note 57: Active warning signs (not at schools) – guidelines
Traffic note 62: Intersection speed zones – guidelines and requirements

7.3 Other resources

Name
Health and Safety at Work Act 2015
Land Transport Rule: Traffic Control Devices 2004 – Shared Path Behavioural and Cycle Detector Loop Road Markings

7.4 ITS standard drawings

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

Drawing number

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.
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)
Display matrix	Visible part of an electronic sign or signal 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
Frangible	Performance capability of structures, which are designed to shear or collapse when struck by a vehicle, minimising the impact hazard to the vehicle's occupants
Hz	Hertz
ISZ	Intersection speed zone
ITS	Intelligent transport system(s)
km/h	Kilometres per hour
LED	Light-emitting diode
m	Metre
m/s	Metres per second
mm	Millimetres
Pixel	Smallest controllable element of a display matrix for an electronic sign or signal
RAMM	Road assessment and maintenance management
RCA	Road controlling authority
SAT	Site acceptance test
SID	Speed indicator device
SLA	Service level agreement

Term	Definition
TCD	Traffic control device
TCD manual	Traffic control devices manual
TCD Rule	Land Transport Rule: Traffic Control Devices 2004
TTM	Temporary traffic management
TUDS	Total underground distribution system – power supply pit

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
2.8	Power supply	Communications infrastructure core requirements standard	000 Core requirements
2.9	Communications coverage	Electrical core requirements standard	000 Core requirements

10 DOCUMENT CONTROL

10.1 Document information

Document number	ITS-STND-AWRS-YYYYMM
Previous document number/s (if applicable)	P32 Notes for Electronic Warning Signs on State Highways 16 March 2011
Document status	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			

11 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	14/09/2022	Richard Quiney and Mike Darnell	WSP	Second draft
0.4	10/11/2022	Richard Quiney and Mike Darnell	WSP	Third draft
0.5	20/12/2022	Richard Quiney and Mike Darnell	WSP	4th draft for industry consultation
0.6	28/04/2023	Richard Quiney and Mike Darnell	WSP	5th draft updated
0.7	28/04/2023	Anandita Pujara	Document Manager, NZTA	Updated purpose with target application of the document
0.8	02/05/2023	Matthew Bauer	Editor, Clear Edit NZ	Copyedit
0.9	05/05/2023	Matthew Bauer	Editor, Clear Edit NZ	Proofread
0.10	19/05/2023	Anandita Pujara	Document Manager, NZTA	Changes to terminology definition and purpose section
0.11	08/06/2023	Richard Quiney and Mike Darnell	WSP	Updates to Section 5.3 and 5.5
0.12	6/07/2023	Anandita Pujara	Document Manager, NZTA	Updated to clarify the contractual roles as per ratification group's feedback
0.13	20/12/2023	Anandita Pujara	Document Manager, NZTA	Updated as per RG chair comments