

AS 5156:2020



Electronic speed limit signs



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Preface

This Standard was prepared by Standards Australia Committee LG-006, Road Traffic Signals, to supersede AS 5156—2010.

The objective of this Standard is to specify requirements for the design, construction and performance of electronic speed limit signs (ESLS) based on light-emitting diode technologies. ESLS are intended for use in road traffic management.

Major changes in this edition are as follows:

- (a) Annulus size altered and its display redefined.
- (b) Numerals size redefined.
- (c) Luminous matching of colour added.
- (d) Chromaticity coordinates for white changed.
- (e) Civil twilight time information removed.

The use of any signs, including electronic speed limit signs, for road traffic management is subject to regulation by traffic control authorities. Guidance and requirements on their use is provided in the series of Standards AS 1742, *Manual of uniform traffic control devices and relevant Austroads guidelines*.

This Standard has been developed with reference to Austroads *Best practice for variable speed limits: Best practice recommendations*.

The terms "normative" and "informative" are used in Standards to define the application of the appendices to which they apply. A "normative" appendix is an integral part of a Standard, whereas an "informative" appendix is only for information and guidance.

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Australian Standard®

Electronic speed limit signs

Section 1 Scope and general

1.1 Scope

This Standard covers electronic speed limit signs composed of discrete light-emitting elements intended to be permanently mounted or portable, adjacent to or over roadways, for the purpose of communicating speed restrictions to approaching road users. It specifies requirements for the design, construction, performance and certain aspects of the installation of electronic speed limit signs, including their associated control systems.

This Standard does not cover lane use management signs.

1.2 Application

It is intended that electronic speed limit signs conforming to this Standard be primarily used to provide regulatory control of traffic speed to road users. This includes school speed zones, shopping centre speed zones, roadwork speed zones and freeway speed limit systems. The speed signs may also be used to display auxiliary messages as shown in this Standard.

1.3 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document.

NOTE Documents referenced for informative purposes are listed in the Bibliography.

AS 1742, *Manual of uniform traffic control devices*

AS 1743, *Road signs — Specifications*

AS 1744, *Forms of letters and numerals for road signs (known as Standard alphabets for road signs)*

AS 2700, *Colour Standards for general purposes*

AS 4086.1, *Secondary batteries for use with stand-alone power systems, Part 1: General requirements*

AS 4086.2, *Secondary batteries for use with stand-alone power systems, Part 2: Installation and maintenance*

AS 4509.2, *Stand-alone power systems, Part 2: System design guidelines*

AS 60068.2.6, *Environmental testing, Part 2.6: Tests — Test Fc: Vibration (sinusoidal)*

AS 60529, *Degrees of protection provided by enclosures (IP Code)*

AS/NZS 1170.2, *Structural design actions, Part 2: Wind actions*

AS/NZS 1734, *Aluminium and aluminium alloys—Flat sheet, coiled sheet and plate*

AS/NZS 1768, *Lightning protection*

AS/NZS 3000, *Electrical installations (known as the Australian/New Zealand Wiring Rules)*

AS/NZS 3100, *Approval and test specification — General requirements for electrical equipment*

AS/NZS 3190, *Approval and test specification — Residual current devices (current-operated earth-leakage devices)*

AS/NZS 4680, *Hot-dip galvanized (zinc) coatings on fabricated ferrous articles*

AS/NZS 61000.6.1, *Electromagnetic compatibility (EMC), Part 6.1: Generic standards — Immunity for residential, commercial and light-industrial environments*

AS/NZS 61000.6.3, *Electromagnetic compatibility (EMC), Part 6.3: Generic standards — Emission standard for residential, commercial and light-industrial environments*

IEC 60068-2-30, *Environmental testing — Part 2-30: Tests — Test Db: Damp heat, cyclic (12 + 12 h cycle)*

ISO/CIE 19476, *Characterization of the performance of illuminance meters and luminance meters*

1.4 Terms and definitions

For the purpose of this Standard, the following terms and definitions apply.

1.4.1

display

face of a sign used to form the speed limit, annulus and conspicuity devices

1.4.2

electronic speed limit sign

speed restriction sign that uses light-emitting technologies

1.4.3

equivalent area

apparent visual area of the lit pixel

Note 1 to entry: The width of the equivalent area is taken to be numerically equal to the centre-to-centre distance of any two adjacent pixels, see [Figure 5.1](#).

1.4.4

frame

stable state displayed on a ESLS that is preceded by and followed by a change of state

1.4.5

full matrix sign

sign using a rectangular array of pixels to form the entire display of numerals, annulus and where provided the conspicuity devices

1.4.6

group controller

master controller that controls all connected signs

1.4.7

Global Navigation Satellite System

GNSS

global satellite system that provides position and timing data

1.4.8

luminance ratio

LR

defined relationship between the luminance generated by the signs and the luminance due to reflected incident light

Note 1 to entry: Luminance ratio is calculated by —

$$LR = \frac{(L_a - L_b)}{L_b}$$

where

L_a = the measured luminance resulting from the sign with all pixels active (i.e. energized) under external illumination

L_b = the measured luminance resulting from the sign with all pixels inactive (i.e. blanked) under external illumination

1.4.9

luminous intensity half-angle

off-axis angle at which the luminous intensity is half that of the value measured on the reference axis (the mechanical axis)

1.4.10

matrix

rectangular array of pixels

1.4.11

message

active display content

1.4.12

pixel

smallest switched unit from which active messages are created

1.4.13

plan

defined combination of messages complete with relative timing

1.4.14

Product Host Control System

PHCS

software program supplied by the sign manufacturer for remote and local control, configuration, monitoring, testing and diagnostics of the sign

1.4.15

sign controller

for a stand-alone sign, the sign controller is the integral controller of the sign. For a multi-sign system, each sign controller is controlled by a group controller

1.4.16

stroke width

width of a vertical stroke expressed as the width of the equivalent area of the lit pixel(s)

Section 2 General design and arrangement

2.1 General

The sign shall be designed to provide continuous and reliable operation for the roadside environment.

The sign and all mounting, support and access structures shall be constructed from durable materials, treated to ensure optimum performance under prolonged exposure to atmospheric and site conditions prevalent in the geographical region in which they are intended to be used.

The design and installation of the sign, sign support structure and associated equipment shall be vandal-resistant against attempted damage to equipment and attempted unauthorized access to interiors of housings and casings.

The construction and layout of the sign enclosure, framework and internal components shall allow in situ removal and reinstatement of pixel modules.

2.2 Design life

The designed operating life of the sign and its support structure shall be as follows:

- (a) For the electrical system — not less than 15 years.
- (b) For the sign enclosure — not less than 20 years.
- (c) For roadside cabinet — not less than 20 years.
- (d) For the fixed sign mounting, support and access structures — not less than 50 years.

2.3 Markings and labels

All markings shall be provided in clear, permanent, weatherproof formats.

The sign shall be marked, in a prominent position at the rear of or inside the housing, with the following information:

- (a) Product/model name or brief description identifying the unit.
- (b) Manufacturer's name.
- (c) Manufacturer's type number.
- (d) A unique serial number.
- (e) Description and rating of the primary power supply system, including nominal voltage, current and power consumption for operation.
- (f) Relevant Regulatory Compliance Marking (RCM).

Section 3 Mechanical requirements

3.1 Sign enclosure

The sign enclosure shall be constructed from marine grade aluminium alloy 5052 H32 or 5251 H32 to AS/NZS 1734, or stainless steel of grade 316 or 321. The sign enclosure shall be reinforced, braced or both to facilitate the erection and continued operation of the unit in the intended application.

All external metal sections of the completed enclosure shall be treated (e.g. polyester powder-coated). The surfaces shall be thoroughly cleaned and subject to the appropriate pre-treatment before the treatment is applied. The finish to the surface shall ensure that deterioration due to atmospheric and local environmental conditions has no detrimental effect on the structural integrity or appearance (including fading) of the finished enclosure for a period not less than 10 years.

The sign enclosure shall be free from sharp edges or protrusions.

The colour of the front face of the sign shall be matt black.

The sign enclosure shall incorporate the following features:

- (a) Where a viewing window is provided for the display, it shall be of high impact, UV-resistant, anti-glare, non-polarizing, polycarbonate material. The material thickness shall be in accordance with the material manufacturer's specifications, based on the window size and window-fixing method compatible with the sign manufacturer's specifications.
- (b) Where no viewing window is provided for the display, the panel on which the pixels are installed shall not deform from its design shape to an extent that the sign's photometric performance is adversely affected under any of the required environmental operating conditions.
- (c) The size of the viewing area shall be such that, when the sign is installed on its support structure, the side and bottom edges of the display face shall be fully visible at viewing angles of 45° (horizontal) and 30° (vertical) respectively, to an axis perpendicular to the display face.
- (d) Lockable, left or right-hinged door(s) on the front or rear of the enclosure, as specified by the purchaser, to allow access to the internal components of the sign. Each door shall be provided with UV-stable closed-cell door seals and fitted with fastener(s) operated by a security key approved by the sign purchaser. Door stays shall be provided to secure the doors in the open position.
- (e) A suitable venting and/or air circulation system to positively exclude dust, dirt and water from entering the sign enclosure. Air filters that require servicing shall not be used.
- (f) A moisture inhibitor and ventilation system that maintains a low relative humidity level inside the sign enclosure.

All sundry components used for connection and/or bracing of the sign onto the support structure shall be manufactured or constructed from suitably protected materials. All ferrous metal works, excluding stainless steel, shall be hot-dip galvanized in accordance with AS/NZS 4680.

Contact between untreated, dissimilar metals (both within and external to the sign enclosure) shall be avoided.

3.2 Sign mounting facilities

The sign shall be designed for rear mounting, bottom mounting or mounting as specified by the purchaser.

Where specified by the purchaser, the enclosure design shall incorporate means for adjusting the angle of the mounted sign during installation and commissioning to ensure correct line of sight.

3.3 Roadside cabinet

3.3.1 Application

This Clause applies where roadside cabinets are specified by the purchaser.

Where a roadside cabinet is provided it shall conform to the requirements of [Clauses 3.3.2](#) to [3.3.6](#).

3.3.2 Construction and finish

A weatherproof roadside cabinet shall be provided which shall be accessible at ground level.

The roadside cabinet shall be constructed from marine grade aluminium alloy 5251 H32 to AS/NZS 1734.

The exterior shell shall be free from fasteners such as bolts, screws and pop rivets. The interior and exterior of the roadside cabinet shall be free from sharp corners and projections which may cause injury. All exterior corners and the roof shall have a minimum external radius of 3 mm. All accessible edges shall be free from burrs.

All external metal sections of the roadside cabinet shall be suitably treated and have a durable gloss finish of anti-graffiti polyester powder coating with a minimum thickness of 50 microns. The colour of the exterior finish shall be Smoke Blue (Colour No. T33) in accordance with AS 2700 unless otherwise specified by the purchaser.

3.3.3 Access doors

A door shall be incorporated in the roadside cabinet to provide direct access to all internal equipment, including cable clamps and terminals for the connection of external wiring. The required access shall be provided when the door is opened not more than 110° from the closed position.

The size of the door opening shall be as close as practicable to the external dimensions of the roadside cabinet, subject to the requirements for mechanical strength.

The door shall be hinged on either the left or the right side. The hinges shall be corrosion resistant and of the concealed type.

A door-retaining device shall be provided for each door to securely hold the door in the open position under all weather conditions at 110° and at 90° from the closed position.

The housing door shall be fitted with a corrosion resistant three point locking system. This shall be operable by means of a security key approved by the sign purchaser.

All doors in the roadside cabinet shall be provided with durable and resilient weatherproof sealing gaskets. The sealing gaskets shall be securely held in position and shall be readily replaceable if the equipment is in service.

3.3.4 Ventilation

Ventilation shall be provided to allow convective airflow for cooling and to limit condensation inside the roadside cabinet.

3.3.5 Protection against vandalism

The roadside cabinet shall be designed to withstand vandalism. As a minimum, particular attention shall be given to the design to limit the following:

- (a) Forcibly opening the access door by simple tools or implements, such as by screwdrivers or pliers, being used to open the door locks or part the hinges.
- (b) Forcibly pushing the housing from its mountings.

- (c) Damage to the roadside cabinet or door or mounting base by kicking or pushing.

3.3.6 Contents

The roadside cabinet shall be supplied complete with the following provisions:

- (a) A main switchboard conforming to AS/NZS 3000 for the mains power supply to the sign installation.
- (b) Sign controller or communications ports for the sign controller as detailed in [Section 6](#).
- (c) Communication equipment (e.g. modem and ports).
- (d) A shelf for mounting (b) and (c).
- (e) Backup batteries.
- (f) Where specified a facility switch for four operational positions (see [Clause 3.4](#)).
- (g) Terminations for interconnecting cables.
- (h) A doublesocket-outlet complete with a 30 mA type II residual current device conforming to AS/NZS 3190. The socket-outlet shall be supplied and protected by a dedicated circuit-breaker in the main switchboard.
- (i) Surge and transient protection devices to withstand the surges specified in AS/NZS 1768, Category B, with medium exposure peak amplitudes.

3.4 Facility switch

3.4.1 Application

This Clause applies where facility switches for the control of the sign display are specified by the purchaser. Specification shall include the number of switches, their location, the number of switch positions and the marking of the switch positions

Where facility switches are provided they shall conform to the requirements of [Clauses 3.4.2](#) to [3.4.4](#).

3.4.2 Type and rating

The facility switch shall be an industrial grade switch suitable for use in outdoor equipment.

The facility switch shall only be used to switch extra-low voltage.

The facility switch contacts shall be rated for the switching function. The contact material and rating for the contacts shall be chosen to provide reliable operation for the life of the equipment.

3.4.3 Mounting

The facility switch shall be mounted as specified by the purchaser.

The key access for the facility switch shall be weatherproofed.

3.4.4 Marking

The switch positions shall be indelibly and durably marked on the outside of the housing with the display mode designation.

Where more than one facility switch is specified by the purchaser, each facility switch shall be clearly labelled to indicate which group of signs it controls.

Section 4 Electrical requirements

4.1 Conforming to wiring Standards

The sign and electrical installation for the sign shall conform to all applicable requirements of AS/NZS 3000 and AS/NZS 3100.

4.2 Operating voltage

4.2.1 General

The input supply to the sign shall be a mains supply. The sign shall convert this supply to extra-low voltage levels (refer to AS/NZS 3000) for supplying power to internal functional parts and modules other than socket outlets.

The sign, including the sign controller and associated communications equipment, shall operate correctly and reliably from a mains power supply with supply voltages over the range 180 V to 264 V r.m.s. and for any variations of frequency in the range 48 Hz to 52 Hz. The equipment shall be protected from damage if subjected to voltages and frequency outside these ranges.

4.2.2 Battery backup

Where specified by the purchaser, a battery backup system shall be provided with each sign. The backup battery shall conform to AS 4086.1. The installation of the battery in the sign shall conform to AS 4086.2.

Batteries used in the backup system shall be of a deep discharge, low-maintenance type (precluding liquid electrolytes) and shall be automatically charged from an internal system provided within the sign.

In the event of battery failure the sign shall be able to perform, as a minimum, automatic clearing of the display on power failure, and on-site retention of all programming information in the sign controller, achieved by the use of non-volatile memory or battery backed up RAM.

4.2.3 Lightning protection

The equipment shall provide surge protection to withstand the surges specified in AS/NZS 1768, Category B, with medium exposure peak amplitudes.

Lightning protection in accordance with AS/NZS 1768 shall be provided to sign installations. Records of the lightning protection circuit and arrangement, and measured earth resistance, shall be provided to the purchaser.

4.3 Solar power

Where specified by the purchaser, the sign shall be designed to operate on solar power.

System sizing of the photovoltaic modules and batteries shall be in accordance with AS 4509.2. The batteries shall conform to AS 4086.1. The installation of the batteries shall conform to AS 4086.2.

4.4 Communications equipment

Where specified by the purchaser, a communications link shall be provided for communication between the sign or group controller and the specified host control centre. A modem compatible with the communications link and existing communications equipment at the specified host control centre shall be provided in the sign enclosure or roadside cabinet.

NOTE Statutory requirements may apply to communications equipment and its certification.

4.5 Real-time clock

The sign shall have a real-time clock that provides for the time and date functions of years, months, days, hours, minutes, seconds, and tenths of a second.

The accuracy of the real-time clock shall be better than ± 1 s within a one-week period. The real-time clock will be synchronised periodically by the specified host control system, see [Clause 5.1.3](#).

The sign shall provide a means to check that its clock is functioning for correct operation. In the event that the real-time clock fails and cannot be automatically reset to the correct time, the sign shall show the default display as specified by the purchaser.

The real-time clock shall be capable of re-establishing the correct time following a power loss.

The real-time clock shall have a separate and dedicated battery backup system.

4.6 Electromagnetic compatibility (EMC)

4.6.1 Immunity

All equipment covered by this Standard shall conform to AS/NZS 61000.6.1.

The immunity of the sign shall be tested on a complete sign.

4.6.2 Electromagnetic emissions

All equipment covered by this Standard shall conform to AS/NZS 61000.6.3.

NOTE Statutory requirements for electromagnetic emissions may apply to equipment covered by this Standard.

The emissions of the sign shall be tested on a complete sign.