TCS 071 - 2020

Specification for

Side Road Activated Speeds (SRAS)

Supply and installation

Version: 2020
Revision: A

VICTORIA State Government | Department of Transport

TCS 071 – 2020

Foreword

This specification has been developed by Department of Transport (DoT). It is one of a number of technical specifications, and associated standard drawings, which set out the requirements for roadside ITS devices, traffic signal equipment and other electrical equipment and associated devices and control systems.

This specification is intended for use in all relevant works undertaken by or on behalf of DoT.

DoT Standard Drawings, Specifications and Guidelines are available for downloading from the VicRoads website: https://www.vicroads.vic.gov.au/business-and-industry/technical-publications/electrical-and-intelligent-transport-systems

Specification updates. DoT specifications and associated standard drawings are subject to periodic review. To keep the specifications up to date, amendments or new editions are issued as necessary. It is therefore important for users of DoT specifications to ensure that they have the latest version and associated amendments.

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Revision History

Version	Revision	Date	Author	Description
2019	A	March 2019	ITS	New specification
2019	B	December 2019	ITS	Specification Update
2020	A	September 2020	ITS	• Fully revised and reformatted. • New section for controller, expanded details for system components, expanded operation and control, added details on Modbus operation. • Expanded installation section. • Introduction of Op Sheet requirement.

Contents

SECTION 1 - SCOPE AND GENERAL

1.1 SCOPE

1.1.1 This specification covers the functional, electrical, operation and installation of Side Road Activated Speeds (SRAS) systems, intended for use in high risk areas on rural road intersections, particularly where smaller side roads intersect with main roads.

1.1.2 This specification is not intended to cover the requirements or operation of ESLS used as part of school speed zone treatments, strip shopping centre treatments and Lane Use Signs (LUS). The requirements for these are outside the scope of this specification and are available in other specifications.

1.1.3 For details of the typical operation of a SRAS refer to Appendix F.

1.2 GENERAL

1.2.1 SRAS systems are intended to reduce the speed limit on a high-speed main road to facilitate the safer entry of vehicles from a side road.

1.2.2 Vehicles on side roads approaching high risk intersections will be detected and trigger an electronic speed limit sign on the main road, typically reducing the speed limit by up to 30 km/h.

1.2.3 This reduced speed limit will be active for as long as there are vehicles waiting to enter or cross the main road.

1.2.4 Electronic Speed Limit Signs (ESLS) are used to display a legally enforceable speed limit to be adopted at different times. Any reference to "sign" within this document shall be taken to mean "Electronic Speed Limit Sign".

1.2.5 A SRAS system operates as an autonomous, stand-alone system.

1.2.6 Components of a typical SRAS system include:

- The SRAS Controller (referred to as the Controller).
- Electronic Speed Limit Signs.
- Vehicle detectors.
- Wireless communications between the master controller and each ESLS and radar type vehicle detector.
- A 3/4/5G communications link for connection to STREAMS
- Associated static signage (not covered by this specification).

1.2.7 ESLS provided as part of a SRAS system are required to meet the relevant requirements of TCS 037, Specification for the Supply of Electronic Speed Limit Signs as detailed in this specification.

1.2.8 All ESLS and SRAS Controllers shall be Type Approved as detailed in Appendix D.

1.2.9 Where default posted speed limits are 90 km/h or above, size C signs with respect to TCS 037 and AS 1743 shall be used.

1.2.10 When displaying the reduced speed, the annulus shall flash in accordance with Section 5 of TCS 037.

1.2.11 Individual tender documents shall detail the speed and size of signs required for a specific project.

1.2.12 The design of each SRAS site shall be undertaken by others in accordance with Technical Alert Document – "Distances of ESLS and Side Road Detection for Side Road Activated Speeds SRAS" and any other relevant documentation.

1.2.13 Example site layouts have been included in Appendix F.

1.2.14 Example Operation Sheets (Op Sheets) have been included in Appendix G.

1.3 INTELLECTUAL PROPERTY

1.3.1 In relation to all Intellectual Property used in/or to operate the system, the manufacturer shall grant to DoT non-exclusive licence to use or provide to DoT authorised contractors any and all software, firmware or programs required to operate and maintain the SRAS systems and components that without the licence, could be breach of the licensors Intellectual Property.

1.3.2 Intellectual Property shall include, but not be limited to, the following:

- Software required to program and configure individual sites.
- Software required to enable maintenance and fault finding of SRAS
- Schematic diagrams.
- Circuit diagrams.
- Wiring diagrams.
- Listings of replaceable components and sub-components.
- Any and all operational and maintenance documentation.

1.4 ACRONYMS

The acronyms used in this document shall be interpreted as follows:

ACMA	Australian Communications and Media Authority
AS	Australian Standard
CLI	Command Line Interface
DoT	Department of Transport (Roads) (formerly VicRoads)
ELV	Extra Low Voltage
ESLS	Electronic Speed Limit Sign
EMC	Electromagnetic Compatibility
FP	Field Processor
GPS	Global Positioning System
GNSS	Global Navigation Satellite System
HTTPS	Hypertext Transfer Protocol Secure
ICMP	Internet Control Message Protocol
IP	Ingress Protection (degree of protection)
ITS	Intelligent Transport System
LED	Light Emitting Diode
LUS	Lane Use Sign
LUMS	Lane Use Management System
NTP	Network Time Protocol
NZS	New Zealand Standard
PHCS	Product Host Control System
RCD	Residual Current Device
SDI	Simple Device Interface
SNMP	Simple Network Management Protocol
SRAS	Side Road Activated Speed system
SSH	Secure Shell
SSL	Secure Sockets Layer
STREAMS	An ITS communications/control platform used by Department of Transport to manage traffic operations on freeways
TCP/IP	Transmission Control Protocol/Internet Protocol
TLS	Transport Layer Security

SECTION 2 - RELATED SPECIFICATIONS AND DRAWINGS

2.1 AUSTRALIAN STANDARDS

2.1.1 The fabrication and supply of all components shall conform to the latest version of all relevant Australian Standards.

2.1.2 Where no specific reference is made to an Australian Standard, the materials and processes used shall conform to the relevant Australian Standard or generally accepted practice.

2.1.3 The following related Australian Standards are referenced:

AS/NZS 1170.2	Structural design actions - Wind actions
AS 1743	Road signs - Specifications
AS/NZS 3000	Electrical Installations – Wiring Rules
AS/NZS 3100	Approval and test specification - General requirements for electrical equipment
AS 4086.1	Secondary batteries for use with stand-alone power systems - General requirements
AS 4086.2	Secondary batteries for use with stand-alone power systems - Installation and maintenance
AS/NZS 4509.2	Stand-alone power systems - System design
AS/NZS 4680	Hot-dip galvanized (zinc) coatings on fabricated ferrous articles
AS 5156	Electronic speed limit signs
AS 60038	Standard voltages
AS 60529	Degrees of protection provided by enclosures (IP code).
AS IEC 62619	Secondary cells and batteries containing alkaline or other non-acid electrolytes — Safety requirements for secondary lithium cells and batteries, for use in industrial applications
AS/NZS 61000.6.1	General Standards – Immunity for residential, commercial and light industrial environments
AS/NZS 61000.6.3	General Standards – Emission standard for residential, commercial and light industrial environments

2.2 DOT SPECIFICATIONS AND DRAWINGS

2.2.1 All installation works shall conform to the relevant DoT specifications and related specifications and standards as indicated throughout this document.

2.2.2 The fabrication and supply of all components shall conform to the relevant DoT specifications, and related specifications and standards, as indicated throughout this document.

2.2.3 The following DoT documents are referenced:

Standard Section 732	Installation of ITS Devices
Standard Section 733	Conduits and Pits for Underground Wiring and Cabling
Standard Section 736	Integration of ITS Devices and systems
TCG 016	Product Compliance Process for ITS and Electrical Products
TCS 037	Electronic Speed Limit Signs
TCS 043	Specification for the Supply of Electrical Distribution Cabinets
TCS 054	Specification for the Installation of Inductive Detector Loops
TC-1320	Detector Pit Installation details
TC-2032	Loop Installation Details – Freeway Data Station
TC-2100	Standard Cabinet Label
TC-2105	Pedestal Controller Label
Technical Alert - Road and Traffic Design	Locations of ESLS and Side Road Detection for Side Road Activated Speeds (SRAS)
Final Drawing Presentation Guidelines	VicRoads Design – Final Drawing Presentation Guidelines

2.3 ADDITIONAL SPECIFICATIONS AND DRAWINGS

2.3.1 The fabrication and supply of all components shall conform to the following specifications and drawings as indicated throughout this document.

2.3.2 The following additional documents are referenced:

Transmax	STREAMS Modbus Interface for Simple Devices Device Technical Guide
Transmax	STREAMS Modbus Interface for Simple Devices Device Product Guide

2.4 EXCEPTIONS AND CLARIFICATIONS TO TCS 037

The following changes or clarifications to TCS 037-2019 are summarised in Table 2.1 below.

TCS 037 Clause	Description	TCS 037 Exception / Clarification
1.2.2	Typical Versions of ESLS	See clause 3.2
1.2.3	Use of discrete character or matrix panel	See clause 3.2
1.2.4	Type of sign to be specified	See clause 3.2
3.1.1	Autonomous operation	See clause 3.3
3.1.2	Master/slave operation	See clause 3.3
3.1.3 / 3.1.4	Operating and management system	See Section 4
3.1.7	Master / slave data connection	See clause 3.3
3.1.9	Calendar operation	See clause 3.3
3.2	Network monitoring and control system	See Section 4
3.3	ESLS network management system	See Section 4
3.4	Side road activated speed	
3.5	Display changes due to external switch inputs	See Section 3
3.6	STREAMS operation	See Clause 4.1 & 4.2
3.7	Synchronisation of signs	See clause 5.5
3.8	Monitoring	See clause 5.7
3.9	Logging	See clause 5.8
Appendix A	Network management system	Clause does not apply
Appendix B	Network monitoring and control system	Clause does not apply
Appendix D	Fault notifications and logging	See Clauses 5.7, 5.8 and Appendix C
Appendix E	Guidelines for purchasing and installation	Clause does not apply
Appendix F	Requirements for type approval	See Appendix D

Table 2.1 – Changes and clarifications to AS 2144:2014

SECTION 3 – SRAS SYSTEM

3.1 GENERAL

3.1.1 The main components of a SRAS system include:

(a) A controller;
(b) Electronic speed limit signs; and
(c) Vehicle detectors.

3.1.2 The above components of the SRAS system shall comply with the following requirements.

3.1.3 The number of signs on each approach shall be specified in individual tender documents (typically, a pair of signs is used for each approach).

3.1.4 The location of ESLS shall be specified in individual contract documents.

3.1.5 The number and location of detectors shall be specified in individual contract documents.

3.2 SRAS CONTROLLER

3.2.1 General

3.2.1.1 SRAS sites shall be locally controlled via a SRAS Controller.

3.2.1.2 The Controller is the interface with all ESLS and detectors that form part of the system.

3.2.1.3 The Controller is used to control and monitor the operation of the entire site.

3.2.1.4 All controller configurable parameters shall be configured locally via the PHCS.

3.2.2 Functionality

3.2.2.1 The Controller shall:

(a) Provide a minimum of 8 vehicle detector inputs with capability of expansion up to 12.
(b) Enable configuration of the detector inputs to either activate or deactivate ESLS on a particular (or all) approach(es) as required.
(c) Be configurable to operate up to 4 ESLS.
(d) Enable site specific activation timing as specified in Clause 5.3.

3.2.2.2 The controller shall also:

(a) Accept and log all required alarms from all field devices.
(b) Send all required alarms to STREAMS as specified in Appendix C.
(c) Connect to STREAMS using the Simple Device Interface to report required alarms.

3.2.2.3 All site-specific parameters shall be configurable.

3.2.2.4 The front face of the controller shall include, as a minimum, LED indicators as detailed in Table 3.1.

Function	Operation
Controller power	Illuminated when power available
Communications	Indicates communications via mobile network
System fault	Illuminated when a system fault is detected
Detection	Illuminated when a vehicle is detected

Table 3.1 – Controller LED indicator LED's

3.2.3 Communications

3.2.3.1 Communications between the Controller and each ESLS and radar type detector shall be via licence free wireless communication.

3.2.3.2 Communications between the Controller and STREAMS shall be via a 3G/4G/5G modem.

3.2.3.3 All communications between the Controller and STREAMS shall be via the STREAMS Simple Device Interface protocol.

3.2.4 Real Time Clock

3.2.4.1 The Controller shall include a real time clock.

3.2.4.2 The real time clock shall maintain accuracy to within 1 second per day.

3.2.4.3 The time synchronisation shall set the Controllers local time no less than twice per day via GNSS (GPS).

3.2.4.4 Failure to obtain a valid real time clock synchronisation with the GNSS for a period of 48 hours shall create an alarm.

3.2.5 Facility Switch Function

3.2.5.1 The SRAS Controller shall incorporate an internal facility switch function or manual override function (manual switch and/or software switch), for testing and maintenance purposes.

3.2.5.2 The switch shall provide the positions detailed in Table 3.2.

Switch Position	Function
Auto	This position shall allow the system to operate normally
Off	This position shall switch the signs off
On	This position shall switch on the reduced speed

Table 3.2 - Facility Switch Positions

3.3 ELECTRONIC SPEED LIMIT SIGNS

3.3.1 General

ESLS used for SRAS systems shall comply with the requirements of TCS 037 except as specified below.

3.3.2 Sign Type

3.3.2.1 Signs used for SRAS shall be type approved, single speed display.

3.3.2.2 Sign displays may be either:

(a) Discrete character; or
(b) Matrix display.

3.3.2.3 Multiple speed discrete character signs shall not be used.

3.3.2.4 Matrix signs shall be programmed to only allow the specified speed to display.

3.3.3 Sign Activation

3.3.3.1 Each ESLS shall be activated/deactivated independently via a command from the SRAS controller (not as a master/slave arrangement).

3.3.3.2 Signs shall not operate autonomously via a calendar schedule as required for time-based school speed or shopping centre zones.

3.3.4 Monitoring

3.3.4.1 Signs shall provide notification for all faults as specified in TCS 037.

3.3.4.2 Signs shall send fault notifications to the Controller as specified in Appendix C.

3.3.4.3 All fault notifications shall be date/time stamped as specified in Appendix C.

3.3.5 Logging

3.3.5.1 Signs shall provide all event logging as specified in TCS 037.

3.3.5.2 Signs shall store all event logs as specified in TCS 037.

3.3.5.3 All event logs shall be date/time stamped.

3.3.6 Facility Switch Function

3.3.6.1 Each sign shall incorporate an internal facility switch function or manual override function (manual switch and/or software switch) for testing and maintenance purposes.

3.3.6.2 The facility switch function shall not be accessible from the exterior of the sign.

3.3.6.3 The switch function shall include the positions detailed in Table 3.3.

Switch Position	Function
Auto	This position shall allow the sign to operate normally
Off	This position shall switch the sign OFF
On	This position shall switch the sign ON

Table 3.3 - Facility Switch Positions

3.4 VEHICLE DETECTORS

3.4.1 General

3.4.1.1 Vehicle detectors are used to detect the presence of vehicles and activate/deactivate the reduced speed limit.

3.4.1.2 Each vehicle detection is registered by the SRAS Controller. The Controller then activates/deactivates the speed signs.

3.4.1.3 There are 2 types of detector function required for SRAS sites. They are:

(a) Advance detection; and
(b) Stop line detection.

3.4.2 Advance Detection

3.4.2.1 Advance detection is used to detect a vehicle approaching the intersection on the side road.

3.4.2.2 Advance detectors shall detect a vehicle as it passes through the detection zone.

3.4.2.3 Above ground detectors (e.g. radar or video) shall be used for advance detection.

3.4.2.4 Each advance detector shall be solar powered.

3.4.2.5 Communications between the advance detector and the controller shall typically be by licence free wireless communications.

3.4.3 Stop Line Detection

3.4.3.1 General

3.4.3.1.1 Stop line detection is used to detect vehicles at the stop line of the intersection.

3.4.3.1.2 Stop line detectors shall detect the presence of a vehicle while ever it is in the detection zone.

3.4.3.1.3 Detectors for stop line detection can be either inductive loop detectors or radar type detectors.

3.4.3.2 Inductive Loop Detectors

3.4.3.2.1 Inductive loops can be used where the pavement is suitable for cutting loops. (Installing inductive loops into spray sealed pavement is not recommended).

3.4.3.2.2 Approved, sealed, pre-formed loops are recommended for installation below a spray seal pavement.

3.4.3.2.3 Inductive loop detectors shall be stand-alone ‘box-type’ detectors.

3.4.3.2.4 Loops and detector feeder cables shall be installed in accordance with TCS 054.

3.4.3.3 Above Ground Detectors

3.4.3.3.1 Above ground detectors must be capable of detecting the presence of a vehicle while ever the vehicle is in the detection zone.

3.4.3.3.2 Above ground detectors shall be installed on an approved support post.

3.4.3.3.3 Where an above ground detector is to be solar powered, the support post must be suitable to support the solar panel, batteries and associated equipment.

3.4.3.3.4 Communications between the stop line detector and the controller shall be by licence free wireless communications or hardwired connection.

SECTION 4 – OPERATION AND CONTROL

4.1 GENERAL

4.1.1 SRAS systems shall be operated and controlled locally via a SRAS Controller.

4.1.2 The SRAS controller shall:

(a) Receive inputs from vehicle detectors
(b) Activate/deactivate the associated ESLS.
(c) Receive and log all faults notifications and event logs from ESLS and vehicle detectors and communications devices that interface with the Controller.
(d) Create all required alarms as specified in Appendix C.
(e) Communicate with STREAMS via the STREAMS Simple Device Interface.

4.1.3 The SRAS system operation shall be capable of remote monitoring via a secure web interface using a standard browser over DoT's VPN.

4.1.4 In addition to the above web-based monitoring, limited remote monitoring of the SRAS system shall be via STREAMS Simple Device Interface. See Appendix B.

4.1.5 Local monitoring and configuration of the site shall be possible using the Product Host Control System.

4.1.6 In the event where a detector fails for any one approach the signs shall default to the reduced speed limit as specified in the tender documents (typically 70 km/h or 80 km/h).

4.1.7 In the event of a major sign failure the sign shall default to a blank.

4.1.8 The firmware/software in the SRAS controller shall be upgradeable so that additional functionality can be added. This functionality may include, for example, alterations to the software interface, additional logging, updated protocols or support for additional protocols.

4.1.9 Firmware/software upgrades shall only be able to be carried out locally.

4.1.10 The SRAS controller shall be capable of being 'restarted' remotely using the web interface, in the event of a controller failure.

4.2 ESLS FUNCTION

4.2.1 The controller shall enable the number of ESLS shall be configurable for each site.

4.2.2 The controller shall monitor the real time operation of all ESLS.

4.2.3 The controller shall activate ESLS following input from the appropriate detector(s).

4.2.4 Where two adjacent ESLS are activated together, the signs shall activate within two seconds of each other.

4.2.5 The grouping of ESLS shall be configurable for correct site operation.

4.3 DETECTOR FUNCTION

4.3.1 The controller shall monitor the real time operation of all vehicle detectors.

4.3.2 The type and number of detectors on site shall be configurable.

4.3.3 The operation and grouping of detectors shall be configurable for correct site operation.

4.3.4 The configuration of detectors shall be via the PHCS as detailed in Clause 4.5 below.

4.4 SYSTEM TIMING CONFIGURATION

4.4.1 System timing shall be configurable to ensure correct timing and operation for each individual site.

4.4.2 System timing shall be configurable locally using the PHCS.

4.4.3 All activation periods and delays shall be configurable via the PHCS in 0.5 second intervals or less.

4.4.4 The minimum intervals for configuration are detailed in Table 4.1 below.

Parameter	Description	Range	Interval
Activation delay	Delay between initial vehicle detection and sign activation.	0 to 10 seconds	0.5 seconds
'On' time	Minimum ESLS activation period. This is reset for each subsequent detection or while the vehicle is present at on stop line detector.	0 to 60 seconds	0.5 seconds
Delay 'off'	Delay between vehicle no longer being detected and sign deactivation.	0 to 10 seconds	0.5 seconds

Table 4.1 - System Timing Configuration Parameters

4.4.5 The site-specific time settings shall be specified in individual contract documents and the site Operation Sheet.

4.5 PRODUCT HOST CONTROL SYSTEM

4.5.1 The Controller supplier/manufacturer shall provide a Product Host Control System for local configuration and monitoring.

4.5.2 The PHCS shall enable local:

(a) Site configuration.
(b) Configuration of ESLS.
(c) Configuration of all detectors.
(d) Configuration of all timer settings.
(e) Monitoring of the real-time operation of the site.
(f) Monitoring of the detector operation in real time.
(g) Monitoring of the ESLS operation in real time.
(h) Configuration and monitoring of all other functions as detailed within this specification.
(i) Access to view and download fault and operational logs.
(j) Switching of ESLS between ON and OFF and AUTO function.

4.5.3 The controller shall provide the ability to connect to the PHCS locally through an ethernet or USB port.

4.5.4 Access through the PHCS shall meet all DoT security requirements and require a username and password for access.

4.5.5 The PHCS shall not allow for remote access to the controller.

4.6 WEB INTERFACE

4.6.1 The Controller supplier/manufacturer shall provide a Web interface using a standard internet browser via a GUI for remote monitoring.

4.6.2 The Web interface shall enable the remote:

(a) Monitoring of the real-time operation of the site.
(b) Monitoring of detector operation in real time.
(c) Monitoring of ESLS operation in real time.
(d) Observation all configurable settings (e.g. time settings, detector function).
(e) Access to view and download fault and operational logs.

4.6.3 The Web interface shall not allow for any site configuration or operational changes to be made remotely.

4.6.4 Access through the Web interface shall meet all DoT security requirements and require a username and password for access.

4.7 MONITORING

4.7.1 It shall be possible to monitor the live status and activation of the SRAS system locally via the PHCS as detailed in Clause 4.5 above.

4.7.2 It shall be possible to monitor the live status and activation of the SRAS system remotely via the web interface as detailed in Clause 4.6 above.

4.7.3 In addition to the above, the controller shall be designed to enable limited monitoring through the DoT ITS Platform. See Appendix A for an overview of the STREAMS platform.

4.7.4 Controllers connected to STREAMS shall operate according to the details in Appendix B3 via the STREAMS Simple Device Interface.

4.7.5 The controller shall provide status information to the monitoring system for all devices as specified in Appendix C1.

4.8 LOGGING

4.8.1 The controller shall provide internal fault logging for all device failures, as specified in Appendix C3, with a minimum history of 30 days.

4.8.2 Additionally, the controller shall provide event logging, including detections and activations in accordance with Appendix C, with a minimum history of 30 days.

4.8.3 The controller shall store all the historical logs. If the storage memory becomes full, the controller shall delete the oldest records to make space for the new records as required.

4.8.4 The logs shall be capable of download via a web browser either through a local or secure remote connection. The retrieval/download of the logs is to be in CSV format.

4.8.5 The SRAS controller shall provide an Ethernet interface whereby a laptop can be connected to allow a user to access to the system status and logs.

4.8.6 Access to the device configuration, status and logs shall be secured with usernames and passwords.

4.9 LOCAL SITE COMMUNICATIONS

4.9.1 Communications between the SRAS controller and each ESLS via a suitable licence free wireless connection.

4.9.2 Communications between the SRAS controller and each above ground detector shall typically be via a suitable licence free wireless connection.

4.9.3 Where an above ground detector is used for stop-line detection, hard-wired communications to the controller may be used.

4.9.4 The controller shall log all communications between the controller and the ESLS and the detectors.

4.9.5 The PHCS shall provide the ability to observe communications between each ESLS and detector in real time.

4.9.6 Where the local communications device is a stand-alone device, it shall be located in a position that enables all operational LED indicators to be observed.

4.10 MODEM

4.10.1 Communications between the SRAS controller and STREAMS shall be via a DOT (Roads) approved 3/4G wireless modem via DOT's VPN.

4.10.2 The modem shall meet the requirements detailed in DoT Technical Note TCN 011. Consideration may be given to minor non-compliances.

4.10.3 The antenna for the modem shall be installed in accordance with the modem manufacturers requirements.

4.10.4 The antenna shall be suitable for the remote location to ensure stable and reliable mobile connection.

SECTION 5 - MECHANICAL REQUIREMENTS

5.1 GENERAL

5.1.1 ESLS shall conform to the relevant requirements of DoT TCS 037 "Specification for the Supply of Electronic Speed Limit Signs"

5.1.2 Where Inductive Detector Loops are used, these vehicle detectors are to be installed in accordance with Section 733, TC-2032 and TC-1320 and TCS 054.

5.1.3 Where alternative vehicle detectors are proposed, they are to be installed in accordance with manufacturer guidelines and the agreement of DoT Intelligent Transport Systems group.

5.2 CABINETS FOR SRAS CONTROLLER UNIT

5.2.1 For solar powered systems the control system, battery and all associated equipment shall comply with the requirements of AS 4086.1, AS 4086.2, AS/NZS 4509.2 and be housed in one of the following:

(a) Approved universal roadside cabinet (preferred); or
(b) Approved Intelligent Transport Systems cabinet where additional space is required.

5.2.2 The cabinet shall be locked using a three-point locking system.

5.2.3 The three-point locking system shall be locked using a standard DoT traffic signal controller lock.

5.2.4 Where relevant, the foundation for the control equipment cabinet shall comply with DoT Standard Drawing TC-1203.

5.3 SIGN MOUNTING

5.3.1 Each sign shall be mounted directly onto a support post that is suitable for carrying the associated load.

5.3.2 The support post base plate shall be designed with a standard 350mm PCD rag bolt.

5.3.3 Access for all power supply, control and communication cabling shall be through the centre of the pedestal and shall enter the sign housing through appropriately constructed, sealed entry holes.

5.3.4 The support post and associated foundation shall be engineered to carry the sign loading.

5.4 SOLAR PANEL MOUNTING

5.4.1 Where solar power is specified, the contractor shall ensure that the design of the support post is suitable for carrying the associated load. This may be a solar panel only (where installed separate to the ESLS) or may include the sign and batteries where installed on the same pole. The design should include but not limited to the foundation and pole.

5.4.2 The proposed support post and associated foundation shall be proof engineered by a DoT approved consultant.

5.4.3 Where solar power is specified, 2B traffic signal pedestal shall not be used.

5.4.4 Posts shall be hot-dip galvanized in accordance with the relevant requirements of AS/NZS 4680.

5.4.5 The solar panels shall be installed in a position that minimises the possibility of vandalism and theft. The lowest part of the solar panels should be at least 4m above ground level.

5.4.6 The solar panel shall be designed for ease of cleaning and equipped with deterrents to bird roosting.

5.5 ABOVE GROUND DETECTOR MOUNTING

5.5.1 The support post for above ground detectors shall be:

(a) A 2B traffic signal pedestal, or
(b) An accepted frangible post as detailed in Road Design Note RDN 06-09 A – January 2018.

Note: Frangible posts detailed in RDN 06-09 A – January 2018 shall not be used where mains power is present.

5.5.2 Consideration must be given to the approach speed and distance from the running lane when considering a post type.

5.5.3 The type of post to be used shall be approved by the superintendent.

SECTION 6 - ELECTRICAL REQUIREMENTS

6.1 GENERAL

6.1.1 Due to the remote locations SRAS is installed, the typical power arrangement for SRAS systems will be solar power.

6.1.2 Where power is available at the controller location, it will typically be powered from mains supply.

6.1.3 Unless otherwise specified in individual contract documents, signs shall be solar powered.

6.1.4 Unless otherwise specified in individual contract documents, advance detectors shall be solar powered.

6.1.5 Above ground detectors used for stop-line detection, may be directly powered from the controller.

6.1.6 The sign displays, associated detectors, monitoring and the control and communications equipment shall operate at extra low voltage (ELV).

6.1.7 All equipment shall be internally protected against damage resulting from:

(a) lightning strikes at or near the sign;
(b) electrical transients on power cabling;
(c) electrical transients on communications wiring;
(d) radio frequency interference;
(e) static electrical discharge.

6.2 SOLAR POWER

6.2.1 Where specified in individual tender documents, the system shall be designed for solar powered operation.

6.2.2 The solar power system shall be designed, constructed and installed in accordance with AS 4509.2, AS 4086.1 and AS 4086.2 as specified in Clause 4.4 of AS 5156.

6.2.3 Where solar power is specified, the contractor shall design a suitable standalone solar power system, which shall be designed by an accredited or suitably qualified designer.

6.2.4 When designing the standalone solar power system consideration must be given to the power consumption, the hours of operation, the surrounding environment and the average amount of sunlight available.

6.3 MAINS POWER

6.3.1 Where mains power is specified in the individual tender documents for the controller, the system shall be designed to comply with all applicable requirements of AS/NZS 3000 and AS/NZS 3100.

6.3.2 The mains supply voltage shall be deemed to be 230 Vac +10%, -6% in accordance with AS 60038, Section 2. The system and or sub-elements of the system shall be capable of operating satisfactorily from the same within ±15%.

6.3.3 The Contractor shall install all specified pits and conduits in accordance with DoT Standard Specification Section 733.

6.3.4 Unless otherwise specified in individual tender documents, cabinets used for mains powered systems shall conform to the requirements of TCS 043 "Specification for the Supply of Electrical Distribution Cabinets"

6.3.5 If a new point of supply is established, a Type 2 Distribution Board cabinet, shall be installed. This cabinet is where the point of supply is terminated and where the power meter will be located.

6.4 SRAS CONTROLLER BATTERY BACKUP

6.4.1 Mains powered systems shall include battery backup capable of maintaining normal operation for a minimum period of 24 hours.

6.4.2 Standalone solar powered systems shall include battery backup capable of maintaining normal operation during periods of minimum solar irradiance for a minimum period of 72 hours.

6.4.3 Suitable deep discharge, gel type batteries shall be used in the backup system.

6.4.4 The service life of batteries shall be not less than three years.

6.4.5 In general, batteries shall comply with AS 4086.1. Additionally, lithium batteries shall comply with AS IEC 62619.

6.4.6 The installation of batteries shall comply with AS 4086.2.

6.5 ELECTROMAGNETIC COMPLIANCE (EMC)

6.5.1 All devices supplied under this specification shall comply with:

(a) AS/NZS 61000.6.1 for immunity; and
(b) AS/NZS 61000.6.3 for emissions.

6.5.2 Devices shall also comply with the relevant requirements of the Australian Communications and Media Authority (ACMA) and shall be labelled with a RCM label as shown in Figure 6.1

Figure 6.1 - RCM Compliance Label

SECTION 7 - ENVIRONMENTAL REQUIREMENTS

7.1 GENERAL

ESLS shall conform to the requirements of TCS 037 "Specification for the Supply of Electronic Speed Limit Signs"

7.2 ENCLOSURE PROTECTION

All SRAS controller and battery housings shall meet the enclosure protection requirements for IP45 in accordance with AS 60529 or greater where specified in the relevant Australian Standard or DoT Specification.

7.3 WIND LOADING

7.3.1 The facilities provided for supporting and stabilizing/anchoring the sign (and where applicable, solar panels) shall ensure that, when installed for normal operation, the sign will maintain its intended orientation and position when subjected to the wind-loading conditions applicable to the region in which the sign is intended to be used, in accordance with AS/NZS 1170.2.

7.3.2 All support posts shall be suitable for carrying the load associated with the system, including any cabinets, batteries, and solar panels.

7.3.3 Loading shall include mass of the post and any post mounted appurtenant items, and wind forces for the region as defined in AS/NZS 1170.2.

7.4 TEMPERATURE AND HUMIDITY

7.4.1 The SRAS controller and associated equipment shall be designed to operate under any conditions of the following conditions:

(a) Ambient air temperatures within the range -15°C to 50°C; and

(b) Insolation of up to 1000W/m², incident at an angle of 30° from the vertical, applied to the maximum exposed surface of the equipment

For equipment within enclosures, this may be achieved by:

(c) Double-skin construction of the enclosure with appropriate ventilation; or

(d) Ensuring that all components within the enclosure are temperature rated to at least 60°C; or

(e) Both of the above measures.

7.4.2 Consideration shall be given to protection against the effects of high humidity, including condensation following a drop in ambient temperature.

SECTION 8 - MARKINGS AND DOCUMENTATION

8.1 GENERAL

8.1.1 All SRAS cabinets shall be marked with an appropriate standard cabinet label in accordance with DoT standard drawing number TC 2100 displaying associated site numbers.

8.1.2 The cabinet shall carry readily accessible identification markings (by securely affixed plate or other approved means) which shall include the following information:

(a) Description identifying the unit;
(b) the name, trade name or trademark of the manufacturer;
(c) the equipment code or model number;
(d) batch code, serial number, or other marking to provide traceability under the manufacturer's quality management system;
(e) the rated supply voltage, power and/or current;
(f) date of manufacture;

8.1.3 In addition to the markings and labels identified in Clause 7.1.2, each individual module within the system shall be legibly and durably marked with:

(a) the name, trade name or trademark of the manufacturer;
(b) the equipment code or model number;
(c) batch code, serial number, or other marking to provide traceability under the manufacturer's quality management system;
(d) the rated supply voltage, power and/or current;
(e) date of manufacture;
(f) the type approval number of the relevant Certificate of Suitability (if applicable);
(g) RCM certification (as applicable).

8.2 ELECTRONIC SPEED LIMIT SIGNS (ESLS)

8.2.1 Each ESLS shall be marked, in a prominent position, with the required information specified in TCS 037 and AS 5156.

8.3 SITE SPECIFIC OPERATION AND MAINTENANCE MANUAL

8.3.1 A site specific Operation and Maintenance manual shall be provided for each SRAS site.

8.3.2 A hard copy of the manual shall be stored in the controller cabinet and a soft copy provided in PDF format.

8.3.3 The manual shall include, as a minimum, the following information.

(a) General information on the site such as:

- Site overview
- Site configuration
- All device IP addresses
- Site operation
- SRAS Controller including all relevant technical information
- Product Host Control System User interface
- Site communications
- Parts list for maintenance replacement purposes including Supplier part numbers
- Site specific schematic diagrams
- Alarm and fault diagnostic instructions
- Maintenance recommendations

(b) Specifications for each device installed on site including:

- Controller
- ESLS
- Solar panels
- Storage batteries
- Inductive loop detectors
- Radar detectors
- Communications
- Pole types used on site

SECTION 9 – SRAS SITE SPECIFIC DESIGN

9.1 GENERAL

9.1.1 Each SRAS site shall be designed by DoT pre-qualified traffic design consultant.

9.1.2 The site layout shall be designed in accordance with Technical Alert Document – "Distances of ESLS and Side Road Detection for Side Road Activated Speeds SRAS" and any other relevant documentation.

9.1.3 The design of the site shall include:

(a) 'For construction' drawings drawn in accordance with 'VicRoads Design – Final Drawing Presentation Guidelines' (i.e. microstation).
(b) Number and location of vehicle detectors.
(c) Number and location of ESLS.
(d) Speed to be displayed on ESLS.
(e) Size of ESLS.
(f) Location of SRAS controller cabinet.
(g) Completion of relevant parts of the Operation Sheet (Op Sheet) as described in Appendix G.

9.1.4 The design shall ensure that all devices are:

(a) Protected behind guard rail;
(b) Installed on frangible poles; or
(c) Installed outside the clear zone.

9.1.5 All designs must be approved by DoT.

SECTION 10 - INSTALLATION AND COMMISSIONING

10.1 GENERAL

10.1.1 The SRAS system shall be installed in accordance with:

(a) All the manufacturer's instructions.
(b) The requirements of this specification.
(c) Standard Section 732.
(d) The requirements of individual contract documents.
(e) The SRAS site design.

10.1.2 All pits and conduits shall be installed in accordance with Standard Section 733.

10.1.3 When locating the signs, controller, detectors and other related equipment consideration must be given to the following:

(a) Sign, controller & detectors location;
(b) Sign visibility;
(c) Protection of sign (e.g. guard rail);
(d) Access to the sign for maintenance activities;
(e) Existing static signage.

10.1.4 Signs should be aligned to ensure the maximum visibility to approaching drivers.

10.1.5 The preference should be given to out of-pavement vehicle detectors, where this is possible.

10.1.6 Standard in-pavement inductive loops are not recommended for installation in spray sealed road surface.

10.1.7 Approved, pre-formed, sealed inductive loops are recommended for installation under a spray seal.

10.1.8 Solar panels shall be installed in an area clear of obstructive vegetation and shadows.

10.1.9 As-built drawings, detailing sign locations, detectors, pits and conduits, controller, solar panels, etc shall be provided once the works are complete.

10.1.10 Prior to installing the system in the field the following tests shall be conducted in accordance with Standard Section 736:

(a) FAT (736.07b);
(b) Pre-POP (736.07c);
(c) Pre-SIT (736.07d);

10.1.11 All the above tests shall be witnessed by DoT and documented in an approved test report with signatures of those present.

10.2 INSTALLATION OF CONTROLLER

10.2.1 The controller shall be installed in accordance with individual contract documents.

10.2.2 The controller shall be installed in a location that minimises the risk of being hit by an errant vehicle.

10.2.3 The controller cabinet foundation shall include a concrete apron not less than 1m in all directions around the base.

10.2.4 A standard cabinet label in accordance with Standard Drawing TC-2100 shall be attached to the controller facing the road.

10.3 INSTALLATION OF ESLS

10.3.1 ESLS shall be installed in accordance with individual contract documents and so approaching vehicles have a clear line of site to the signs.

10.3.2 ESLS shall be installed in accordance with the manufacturers' recommendations.

10.3.3 The pole supporting the ESLS shall be installed behind guard rail to protect the device and maintenance technicians from errant vehicles.

10.3.4 A hard stand area shall be provided at the base of the sign support post for ladder access to the sign and batteries for maintenance purposes.

10.3.5 The hard stand area shall be not less than 2m wide (parallel with the sign) and extend not less than 1.5m in front and behind the sign support post.

10.3.6 A standard pedestal controller label in accordance with Standard Drawing TC-2105 shall be attached to each ESLS support post. The label shall include the site number and sign number as per the Op-sheet.

10.4 INSTALLATION OF VEHICLE DETECTORS

10.4.1 Above Ground Detectors

10.4.1.1 Above ground detectors (e.g. radar) are typically used for advance detection.

10.4.2.2 Vehicle detectors shall be installed such that they operate correctly.

10.4.1.3 Advance detectors shall be located in accordance with the design.

10.4.1.4 Stop line detectors shall be installed at the stop line to ensure correct presence detection.

10.4.1.5 All detectors shall be installed in accordance with the manufacturers' recommendations.

10.4.1.6 Above ground detector support posts shall comply with Clause 5.5 of this specification.

10.4.1.7 Where the detector is installed on a pole with solar panel and batteries, the contractor must provide evidence that the pole is suitable for the intended load.

10.4.1.8 A hard stand area shall be provided at the base of the detector support post for ladder access to the detector and batteries for maintenance purposes.

10.4.1.9 The hard stand area shall be not less than 2m wide (parallel with the sign) and extend not less than 1.5m in front and behind the sign support post.

10.4.1.10 A standard pedestal controller label in accordance with Standard Drawing TC-2105 shall be attached to each above ground detector support post. The label shall include the site number and detector number. The detector number shall be as per the Op-sheet.

10.4.2 Inductive Loop Detectors

10.4.2.1 Inductive loops detectors may be used.

10.4.2.2 Inductive loop detectors are typically used for stop-line presence detectors.

10.4.2.3 When installing inductive loops, consideration must be given to the width of the road, distance from the stop line and traffic behaviour to ensure correct detection.

10.4.2.4 Inductive loop detectors are not recommended for installation in spay sealed pavements.

10.4.2.5 Pre-formed, sealed, inductive loops are recommended for installation under spray seal pavements.

10.5 INSTALLATION OF SOLAR PANELS

10.5.1 Solar panels shall be installed in accordance with individual contract documents.

10.5.2 Solar panels shall be installed to ensure maximum exposure to sunlight for the most efficient operation.

10.5.3 Where suitable, solar panels shall be installed on the same support post as the associated ESLS or detector.

10.5.4 If necessary, the solar panel may be installed on a separate support post to ensure maximum sunlight exposure.

10.5.5 The post supporting the solar panel shall be installed behind guard rail to protect the device and maintenance technicians from errant vehicles.

10.5.6 A hard stand area shall be provided at the base of the solar panel support post for ladder access to the solar panel and batteries for maintenance purposes.

10.5.7 The hard stand area shall be not less than 2m wide (parallel with the sign) and extend not less than 1.5m in front and behind the solar panel support post.

10.5.8 A standard pedestal controller label in accordance with Standard Drawing TC-2105 shall be attached to each solar panel support post. The label shall include the site number and associated sign/detector number as per the Op-sheet.

10.6 COMMISSIONING

10.6.1 Commissioning of the system shall be carried out in accordance with Standard Section 736 and the contract specific Site Acceptance Testing.

10.6.2 Field testing as part of the commissioning process shall be conducted in accordance with Standard Section 736:

(a) Inspection Test (736.07e);
(b) POP (736.07f);
(c) SIT (736.07g);
(d) SAT (736.07h);

10.6.3 All the above tests shall be witnessed by DoT and documented in an approved test report with signatures of those present.

10.6.4 Commissioning shall include the following:

(a) Confirm correct installation of all components
(b) Confirm correct operation of all detectors
(c) Confirm correct operation of all signs
(d) Confirm communications with STREAMS
(e) Confirm correct reporting of a sample of alarms to STREAMS

10.7 HAND OVER DOCUMENTATION

10.7.1 Following successful commissioning of the system, the following documentation shall be provided:

(a) Updated as-built plans in Microstation and PDF formats.
(b) Site specific system manual (hard and soft copies)
(c) Updated Op Sheet (hard and soft copies)
(d) DoT Road Asset Inventory (RAI) information

10.7.2 A hard copy of the site-specific manual and the Op sheet shall be provided for storage on-site in the controller.

10.8 OPERATIONAL PERFORMANCE TESTING

Following commissioning, a 90 day operational and performance test period shall commence in accordance with Standard Section 736.07(i).

APPENDIX A - DOT ITS PLATFORM

(Informative)

A1 GENERAL

A1.1 DoT ITS platform currently uses the STREAMS system.

A1.2 STREAMS is owned and maintained by Transmax Pty Ltd, a Queensland based company which is part of Queensland Main Roads.

A1.3 STREAMS is an integrated control system which is being used by DoT to operate its ITS Freeway Management Devices on Melbourne's freeway network.

A1.4 All ITS field devices must be compatible with STREAMS.

A1.5 Typical ITS field devices connected to and operated by STREAMS include:

- Variable Message Signs (VMS)
- Freeway Data Stations (FDS)
- Ramp metering/control signs (RC)
- Lane Control Signs (LCS)
- Lane Use Signs (LUS)
- Travel Time Signs (TTS)

A1.6 The above devices are typically connected to STREAMS via a Field Processor (FP).

A2 FIELD PROCESSOR

A2.1 The FP is used to interface internet protocol (IP) and serially connected field devices to STREAMS.

A2.2 The FP is either installed within a Field Cabinet or in DoT's Data Centre.

A2.3 The ITS Field Cabinet is typically located adjacent to the freeway/highway.

A3 COMPLIANCE WITH STREAMS

A3.1 SRAS systems shall be compatible with the STREAMS Simple Device Interface function.

APPENDIX B - MONITORING AND COMMUNICATIONS

(Informative)

B1 GENERAL

B1.1 A typical SRAS connection schematic is shown in Figure B.1 below.

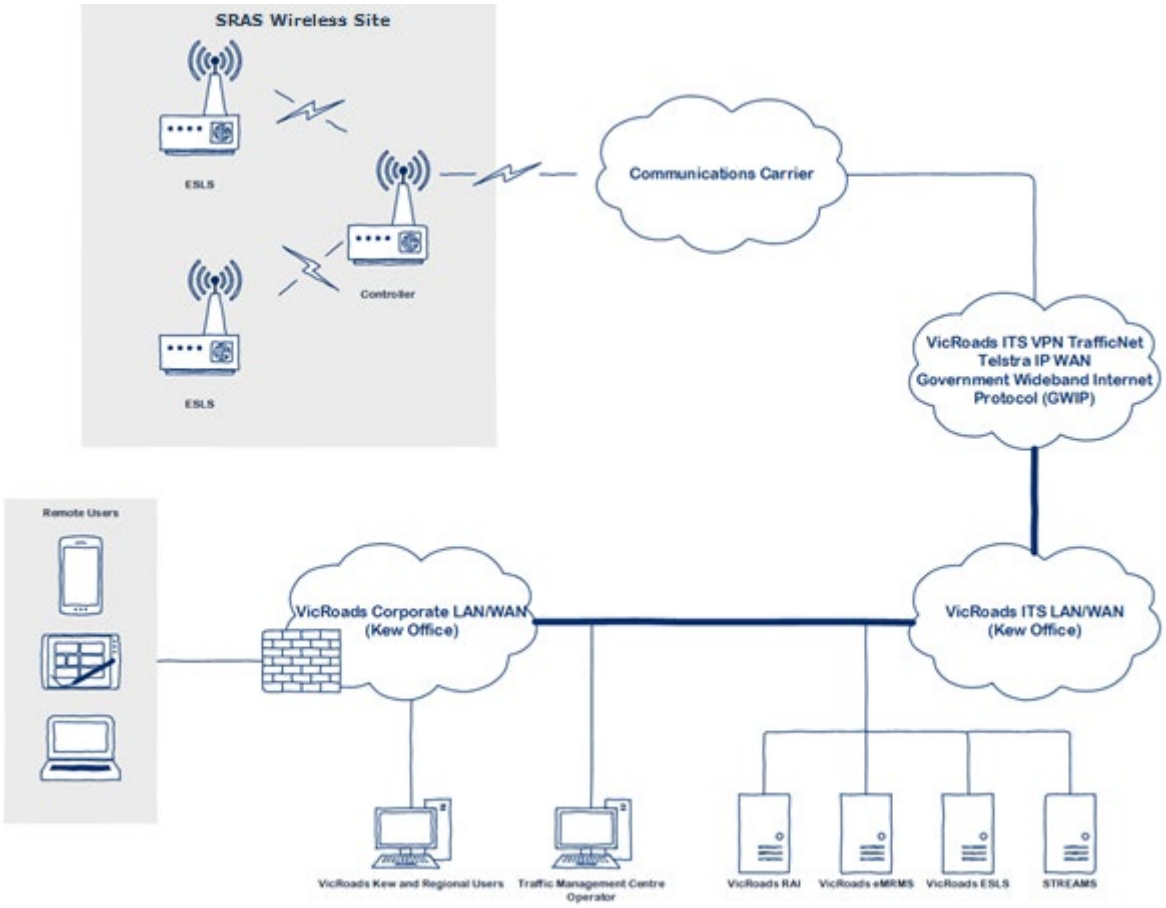


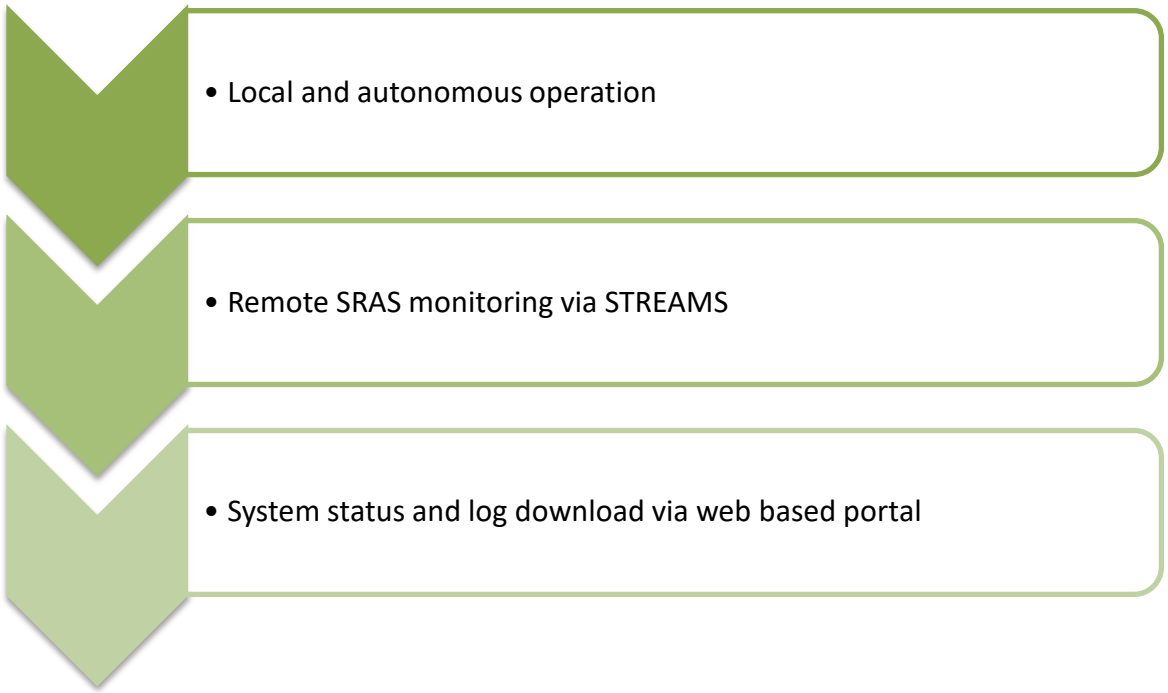
Figure B.1 – Wireless SRAS System

B2 HIERARCHY OF OPERATION

B2.1 Typically, SRAS systems are controlled locally and autonomously.

B2.2 This autonomous operation shall be remotely monitored via STREAMS.

B2.3 SRAS live system status and historical activation and error logs can be remotely accessed via a web based portal.



B3 STREAMS

B3.1 The DoT ITS platform currently uses the STREAMS system to monitor SRAS controllers connected to the DoT communication network. See Figure B.3 below.

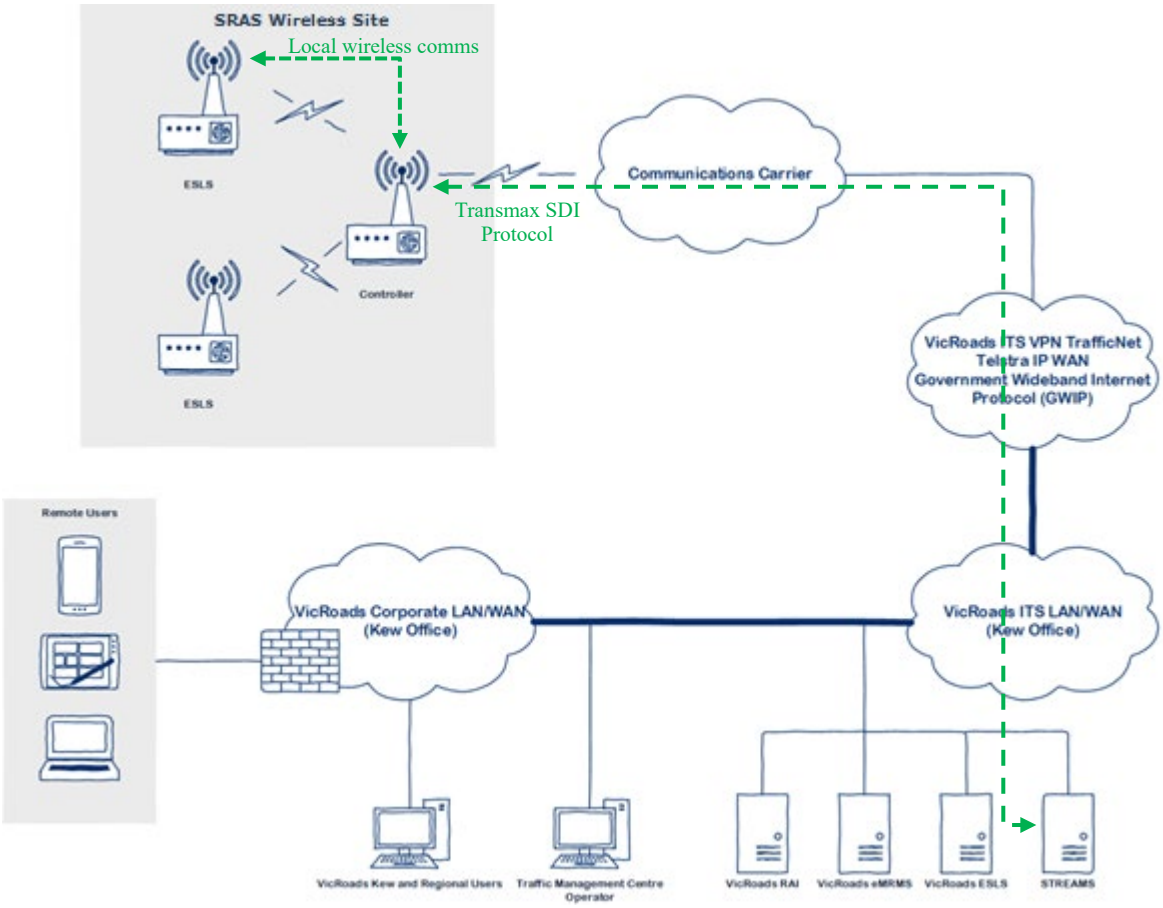


Figure B2 – SRAS STREAMS System

Note: For SRAS connection, the Field Processor is located at the DoT Data Centre.

B3.2 Communications between STREAMS and the SRAS controller shall be via Transmax "Modbus Interface for Simple Devices".

B3.3 Details of device monitoring (both the Modbus Server and the connected system), sensor readings, discrete inputs and logging shall be provided by DoT.

B3.4 Modbus Interface for Simple Devices "Device Technical Guide" and "Device Product Guide" are available from Transmax for additional details.

APPENDIX C - FAULT NOTIFICATIONS AND LOGGING

(Normative)

C1 Electronic Speed Limit Signs

C1.1 The ESLS shall meet all fault notification and event logging requirements as specified in TCS 037.

C1.2 All logs shall be date/time stamped and stored internally in each ESLS.

C1.3 The ESLS shall send all fault notifications and event logs to the SRAS Controller.

C1.4 Each sign fault notification and event log shall include the sign ID.

C2 Vehicle Detectors

C2.1 All vehicle detections shall be sent to the Controller.

C2.2 The Controller shall log all vehicle detections received for all detectors complete with a date/time stamp and unique detector ID.

C2.3 The SRAS controller shall log the 'on-time' and 'off time' for each detection.

C3 SRAS Controller

C3.1 The Controller shall log:

(a) All ESLS fault notifications complete with the unique sign ID;
(b) All ESLS event logs complete with the unique sign ID;
(c) All detector events complete with the unique detector ID (see Clause 3.3);
(d) All communications events (see Clause 3.5);
(e) All faults reported by the Controller; and
(f) All event logs reported by the Controller.

C3.2 All fault notifications and event logs shall be date/time stamped and stored internally in the Controller.

C3.3 The Controller shall send the fault notifications detailed in Table C.1 to STREAMS using the Simple Device Interface module.

C4 STREAMS Fault Notifications

The controller shall provide the alarms detailed in Table C.1 to STREAMS using the SDI module protocol.

C4.1 Controller alarms reported to STREAMS

The alarms detailed in Table C1 shall be sent to STREAMS by the Controller using the Simple Device Interface protocol.

SRAS Controller Alarms		
Entry	**Description**	**STREAMS alarm**
Power supply fail	The power supply for the controller has failed	Controller power fault
Battery low	Battery has 24 hours charge left	Controller battery low
Battery failure	Battery has failed	Controller battery fault
Tilt alarm	Controller is tilted	Controller tilt
Solar panel tilt	Solar panel has tilted	Solar tilt fault
Door open	Controller door is open	Controller door open
Watchdog or processor fail	Controller has flagged a watchdog or processor fail	Controller fault
Facility switch	Facility switch not in the ON position	Facility switch fault
Communication failure – ESLS	The SRAS controller is not able to communicate with an ESLS for more than 60 seconds.	Sign comms fault
Communication failure - detector	Controller stopped communication with radar type detector.	Detector comms fault
GNSS (GPS) fail	The Controller has failed to obtain a time clock update from the GNSS network for 24 hours.	GPS fault

Table C1 – SRAS Controller Alarms

C4.2 ESLS alarms reported to STREAMS

The alarms detailed in Table C2 shall be sent to STREAMS by the Controller using the Simple Device Interface protocol.

ESLS Alarms		
Entry	**Description**	**STREAMS alarm**
Power supply fail	The power supply for the sign has failed	Sign power fail
Sign tilt	Sign has tilted	Sign tilt
Solar tilt	Sign solar panel has tilted	Sign Solar tilt
Watchdog or processor fail	ESLS has flagged a watchdog or processor fail	Sign fault
Display shut down	20% of the signs LED's have failed and sign has shut down	Sign fail
Battery low	Battery has 24 hours charge left	Sign battery low
Battery failure	Battery has failed	Sign battery fail
Door open	Sign door open	Sign door open

Table C2 – ESLS Alarms

C4.3 Detector alarms reported to STREAMS

The alarms detailed in Table C3 shall be sent to STREAMS by the Controller using the Simple Device Interface protocol.

Detector Alarms		
Entry	**Description**	**STREAMS alarm**
Detector alarm	Detector has: • Stopped communicating with the controller • Not toggled for 24 hours • Has a permanent demand (more than 30 minutes on)	Detector Alarm

Table C3 – Detector Alarms

C5 Modbus Protocol Alarm Mapping

The following clauses specify the 'Alarm Data format' and 'Alarm Formatting' to be used for alarm reporting using the Modbus protocol.

C5.1 Controller Alarms

Controller alarms shall be mapped in accordance with the Alarm Data format example below.

Alarm Block Name:	Controller Alarms
Data Format:	Alarm Block
Read Address:	*1:I:0:1:120*

Alarm Mapping:

Bit Position	**Alarm Text**
0	Controller power fault
1	Controller battery low
2	Controller battery fault
3	Controller tilt
4	Solar tilt fault
5	Controller door open
6	Controller fault
7	Facility switch fault
8	Sign comms fault
9	Detector comms fault
10	GPS fault

C5.2 ESLS Alarms

ESLS alarms shall be mapped in accordance with the Alarm Data format example below.

Alarm Block Name:	ESLS1 Alarms
Data Format:	Alarm Block
Read Address:	*1:I:1:1:120*

Alarm Mapping:

Bit Position	Alarm Text
0	Sign power fail
1	Sign tilt
2	Sign Solar tilt
3	Sign fault
4	Sign fail
5	Sign battery low
6	Sign battery fail
7	Sign door open

Alarm Block Name:	ESL2 Alarms
Data Format:	Alarm Block
Read Address:	*1:I:2:1:120*

Alarm Mapping:

Bit Position	Alarm Text
0	Sign power fail
1	Sign tilt
2	Sign Solar tilt
3	Sign fault
4	Sign fail
5	Sign battery low
6	Sign battery fail
7	Sign door open

Alarm Block Name:	ESLS'n'* Alarms
Data Format:	Alarm Block
Read Address:	*1:I:n:1:120*

Alarm Mapping:

Bit Position	Alarm Text
0	Sign power fail
1	Sign tilt
2	Sign Solar tilt
3	Sign fault
4	Sign fail
5	Sign battery low
6	Sign battery fail
7	Sign door open

* Where 'n' is the number assigned to the ESLS.

C5.3 Detector Alarms

Detector alarms shall be mapped in accordance with the Alarm Data format example below.

Register Name:	Detector Alarms
Data Format:	Alarm Block
Read Address:	*1:I(n+1):1:120*

Alarm Mapping:

Bit Position	Alarm Text
0	Detector 1 Alarm
1	Detector 2 Alarm
2	Detector 3 Alarm
3	Detector 4 Alarm
4	Detector 5 Alarm
5	Detector 6 Alarm
6	Detector 7 Alarm
7	Detector 8 Alarm

APPENDIX D - REQUIREMENTS FOR TYPE APPROVAL

(Normative)

D1 General

D1.1 Electronic Speed Limit signs and SRAS Controllers for use on DoT projects are required to hold current DoT Type Approval.

D1.2 The Product Compliance evaluation process shall be carried out in accordance with DoT Guideline TCG 016.

D1.3 To enable assessment for the purpose of granting Type Approval, the manufacturer/supplier is to submit a formal request for Type Approval, for each device type submitted, accompanied by the following:

(a) A complete working sample of the device.
(b) An outline drawing showing the general presentation and overall dimensions of the complete device.
(c) Documentation to demonstrate that the device has been manufactured and supplied under an approved quality assurance system.
(d) Documentation to demonstrate that the sign conforms to the requirements of DoT Specification. This may be by means of submitting test results from approved and appropriately qualified independent testing organisations, or providing the manufacturer's assurance that the product complies with each paragraph of the specification, as appropriate.
(e) Copies of any and all maintenance tools (i.e. software programs) required to maintain the device in the field and written permission for such tools to be provided to any authorised DoT contractor for the purpose of maintaining the device.

D2 Required NATA Accredited Testing

D2.1 Notwithstanding D1, the manufacturer/supplier shall submit test results from a NATA accredited testing organisation to demonstrate compliance with the following:

Requirements	Evidence
Temperature and humidity	Test Report
EMC Compliance	Test Report

NOTE: Temperature and humidity test - The equipment, while in operation, shall withstand continuously for 72 hours at an ambient temperature of 50°C, and with 90% relative humidity, and with 1 kW/m2 insolation applied to the maximum exposed surface, without any adverse effect to its operation. Where it is not practical to provide the required insolation during testing, it is acceptable to increase the upper ambient temperature limit by 10°C as substitute.

D2.2 The supplier shall provide evidence of compatibility for the specified control system.

D3 Compatibility with Transmax SDI Protocol

The supplier shall provide evidence of compatibility with Transmax SDI Protocol.

D4 Other required Information

D4.1 Confirmation that the manufacturer is on the DoT Register for the Pre-qualification for Supply of On-Road Electronic Devices (SOED).

D5 Assessment Procedure

D5.1 The assessment procedure for the product may include, but not limited to, the following:

(a) Assessment of construction, workmanship and critical dimensions;
(b) Preliminary assessment of the device under operation; and
(c) Evaluation of the submitted data against the requirements of the specification.

D5.2 Where some of these procedures have been completed prior to formal submission, the results will be considered in the evaluation, provided there is no relevant change in the design of the product.

D5.3 The supplier is to state whether tests carried out prior to formal submission were carried out on an identical sample of the product.

D5.4 DoT may require a trial installation of the sign to be undertaken.

D6 Type Approval

D6.1 The decision to grant a Certificate of Type Approval is at the sole discretion of DoT.

D6.2 DoT may require additional information or testing to be carried out as part of its evaluation of the product.

D6.3 If the product is approved, a Certificate of Type Approval will be provided to the supplier. Until such time as this Certificate is issued, the product is not to be used for DoT works.

D6.4 The manufacturer shall advise DoT in writing of any changes in hardware or firmware in relation to the Type Approved product, DoT reserves the right to review and approve/reject the design changes at DoT discretion.

APPENDIX E DETAILS TO BE INCLUDED WHEN TENDERING

(Informative)

E1 Installation requirements will be site specific and detailed in individual tender documents.

E2 The following details should be considered when preparing tender documents:

(a) The size of the proposed signs, i.e. B or C size (with respect to TCS 037 and AS 1743);
(b) Whether the proposed signs are mains or solar powered;
(c) Additional requirements for battery backup;
(d) The numbers of signs and speed values to be provided;
(e) The mounting arrangements for the signs;
(f) Traffic counts should be provided for solar calculation purposes.

APPENDIX F EXAMPLE SITE LAYOUTS AND OPERATION

(Informative)

F1 General

F1.1 The following site layout diagrams are provided as examples of typical site layouts and typical operation.

F1.2 These example layouts are not to be used in place of an actual site plan and site-specific concept of operation.

F1.3 The example layouts are for the ESLS operation only and do not include any static signage required.

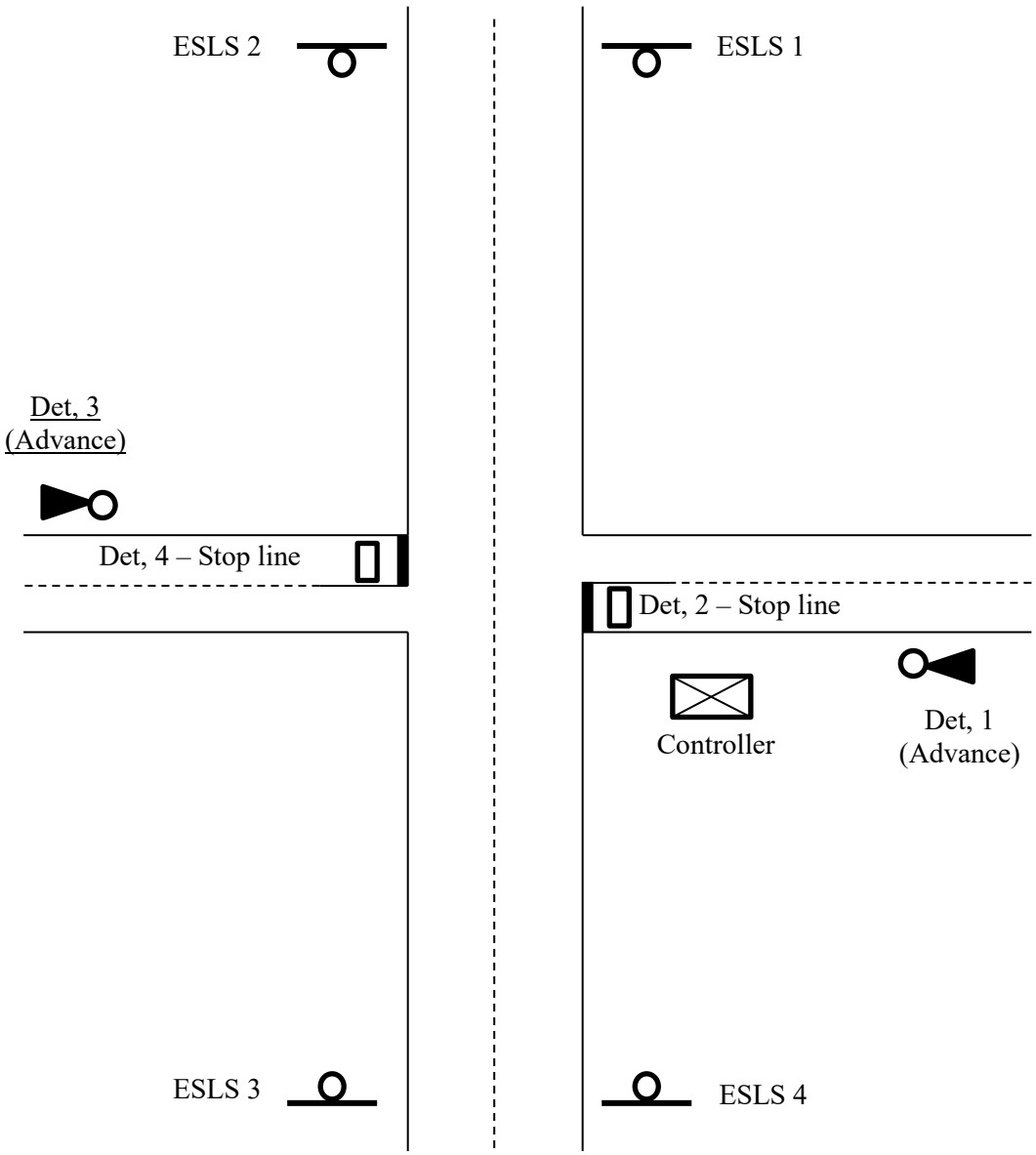
F1.4 Appendix F2 shows a typical arrangement for a road with no median or turn lanes.

F1.5 Appendix F3 shows a typical arrangement for a road with no median and turn lanes.

F1.6 Appendix F4 shows a typical arrangement for a road with a median and turn lanes.

F1.7 For details of timer settings see Clause 4.4 of this specification.

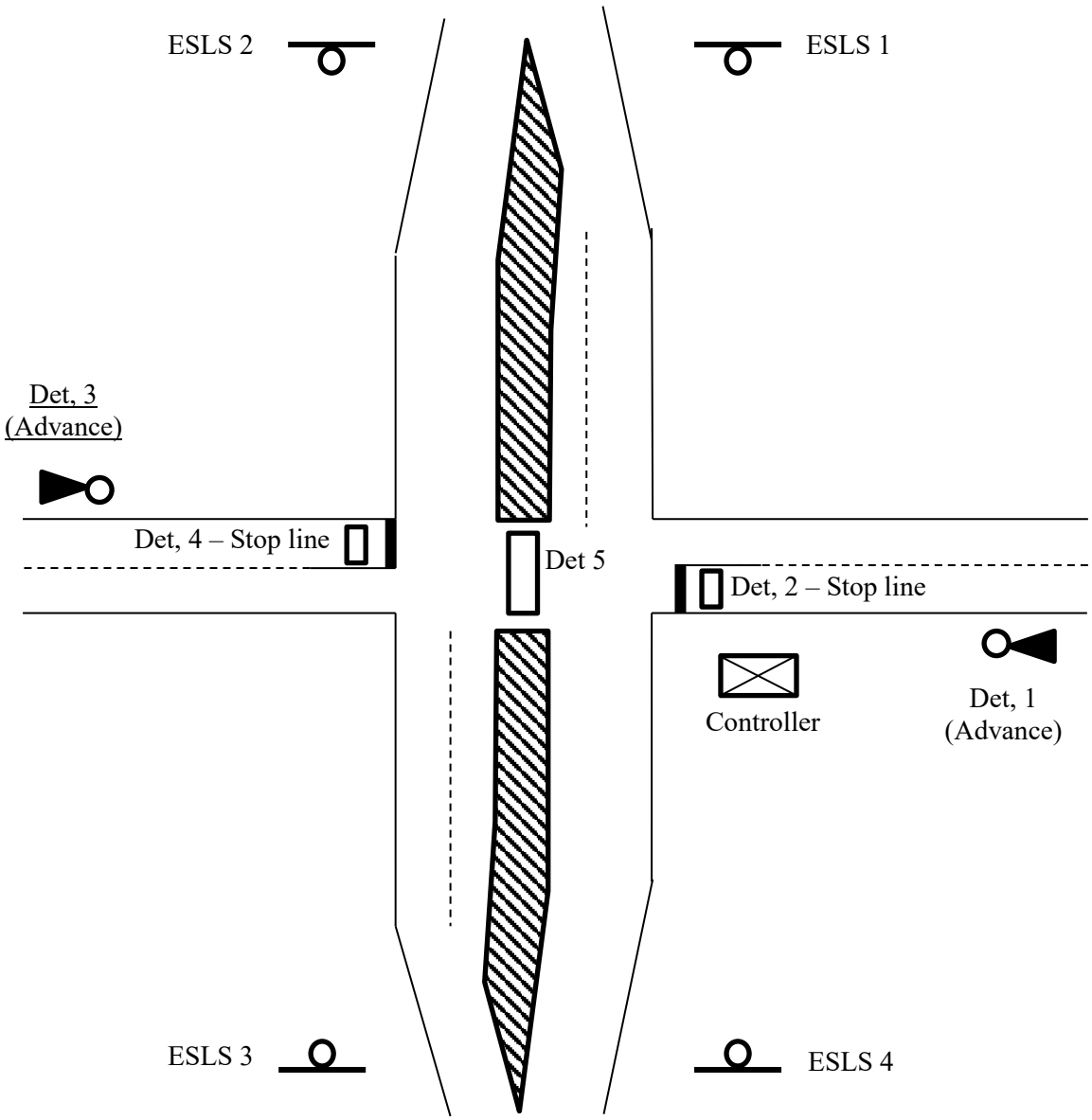
F2 Site with no median and no turn lanes



In the example above the SRAS system would operate as described below.

1. Detector 1 (or 3) detects a vehicle and the controller activates the ESLS for a pre-set time.
2. Detector 2 (or 4) detects a vehicle and the controller restarts the timer.
3. Detector 2 (and 4) are presence detectors that hold the ESLS active while ever a vehicle is present.
4. Once the vehicle departs detector 2 (or 4) and the countdown timer expires, the controller will deactivate the ESLS.

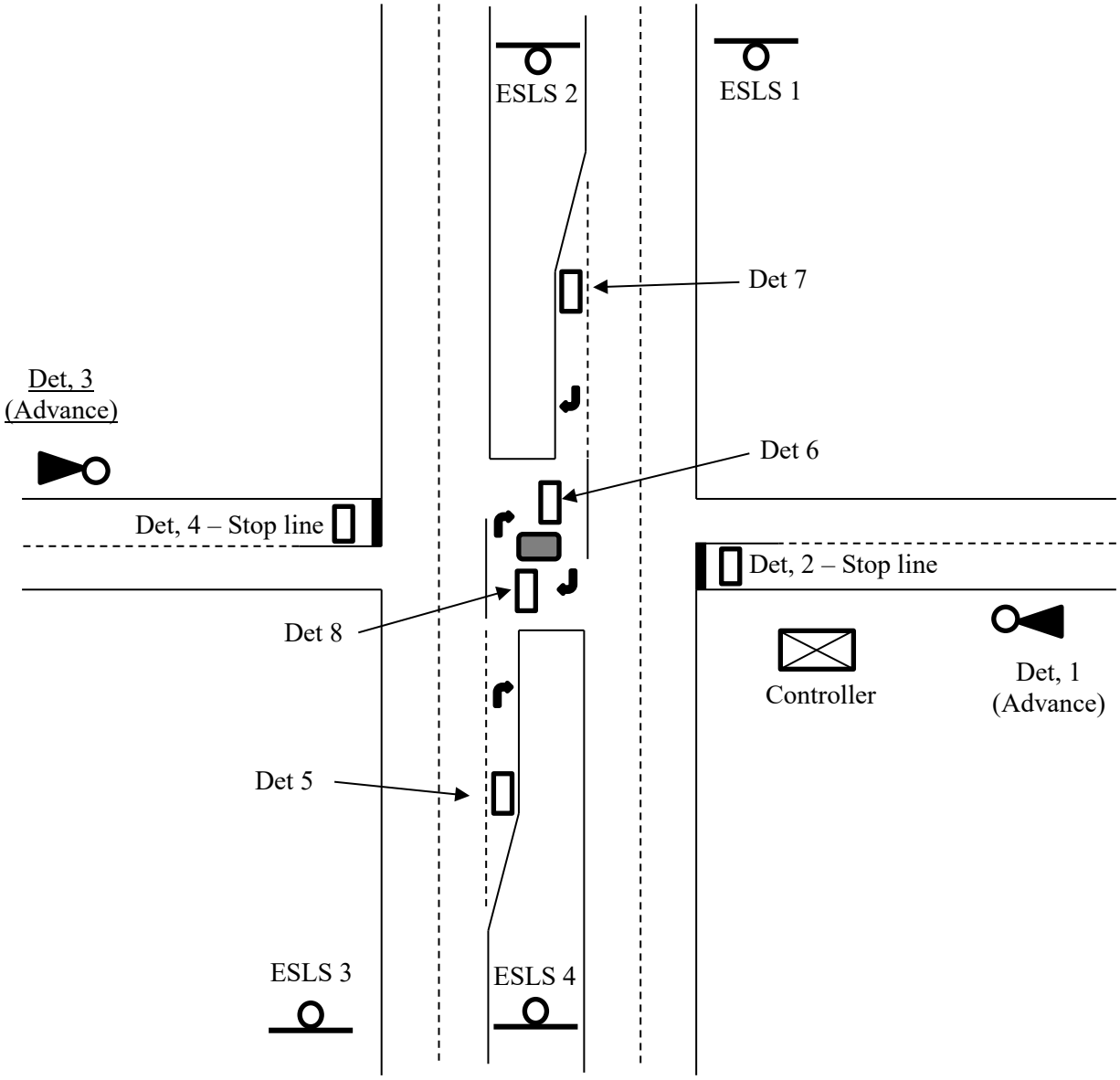
F3 Site with no median and turn lanes



In the example above the SRAS system would operate as described below.

1. Detector 1 (or 3) detects a vehicle and the controller activates the ESLS for a pre-set time.
2. Detector 2 (or 4) detects a vehicle and the controller restarts the timer.
3. Detector 2 (and 4) are presence detectors that hold the ESLS active while ever a vehicle is present and starts the countdown timer once the vehicle clears the detector.
4. Detector 5 is a presence detector (for vehicles turning right) that holds the ESLS active while ever a vehicle is present.
5. Once the vehicle departs detector 2, 4 or 5 and the countdown timer expires, the controller will deactivate the ESLS.

F4 Site with no median and no turn lanes



In the example above the SRAS system would operate in one of the three options described below.

F4.1 Vehicles turning left from the side road

1. Detector 1 (or 3) detects a vehicle and the controller activates the ESLS for a pre-set time.
2. Detector 2 (or 4) detects a vehicle and the controller restarts the timer.
3. Detector 2 (and 4) are presence detectors that hold the ESLS active while ever a vehicle is present.
4. Once the vehicle departs detector 2 or 4 and the countdown timer expires, the controller will deactivate the ESLS.

F4.2 Vehicles turning right from the side road

1. Detector 1 (or 3) detects a vehicle and the controller activates the ESLS for a pre-set time.
2. Detector 2 (or 4) detects a vehicle and the controller restarts the timer.
3. Detector 8 (or 6) detects a vehicle and the controller restarts the timer.
4. Detectors 2, 4, 6 and 8 are presence detectors that hold the ESLS active while ever a vehicle is present.
5. Once the vehicle departs detector 8 (or 6) and the countdown timer expires, the controller will deactivate the ESLS.

F4.3 Vehicles turning right from the main road

1. Detector 5 (or 7) detects a vehicle and the controller activates ESLS 1 and 2 (or 3 and 4) for a pre-set time.
2. Detector 6 (or 8) detects a vehicle and the controller restarts the timer.
3. Detectors 6 and 8 are presence detectors that hold the ESLS active while ever a vehicle is present.
4. Once the vehicle departs detector 6 (or 8) and the countdown timer expires, the controller will deactivate the ESLS.

APPENDIX G – EXAMPLE OPERATION SHEETS

(Normative)

G1 General

G1.1 The following Operation Sheets are provided as examples of typical site layouts and operation.

G1.2 The layout of these example Op Sheets should be used to develop an Op Sheet for each SRAS site.

G1.3 Appendix G2 shows a typical Op Sheet for a simple site arrangement.

G1.4 Appendix G3 shows a typical Op Sheet for a complex arrangement.

G2 – Example Op Sheet for simple site

PROGRAM FOR SIDE ROAD ACTIVATED SPEED SITE

To: Installation Contractor
Responsible Maintenance Officer

From: **Date:**

Site: **Site No.:**

Region: **Municipality:**

Modem IP Address:

Remote web access IP and port number:

Controller Port Number:

Modem mobile number: 123456789

Controller Type: Brand X

Sign Type: Brand X

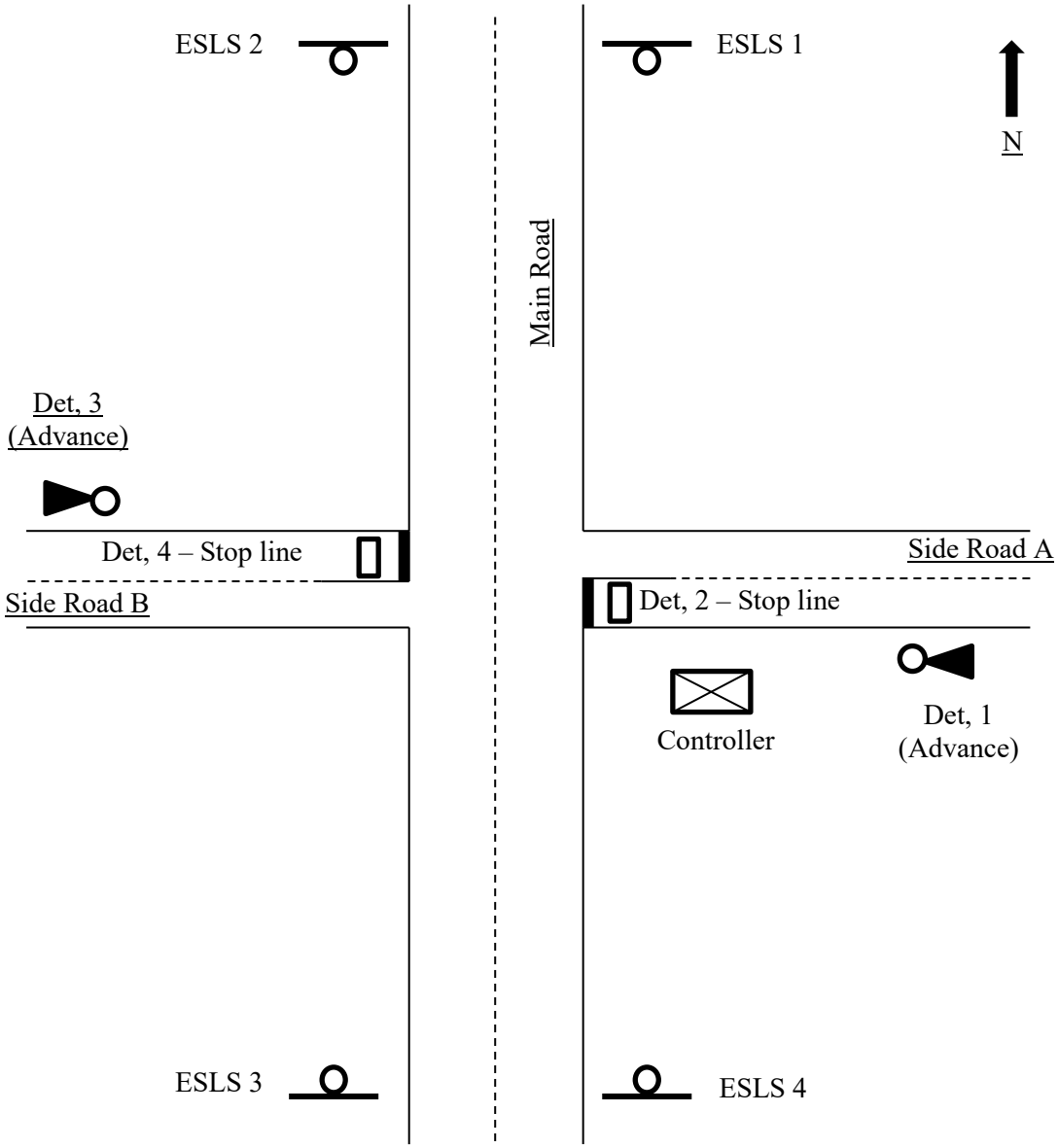
Number of signs: 4

Number of detectors: 4

ELECTRONIC SPEED LIMIT SIGNS

Sign	Speed Displayed	Location
1	70	Main Road, north approach, left side, 300m before intersection
2	70	Main Road, north approach, right side, 300m before intersection
3	70	Main Road, south approach, left side, 300m before intersection
4	70	Main Road, south approach, right side, 300m before intersection

SITE SIGN AND DETECTOR MAP



DETECTOR FUNCTIONS

Detector No.	*Inductive Loop*	*Radar detector*	Location	Call – Start Timer	Extend – Restart Timer	Cancel – Stop Timer	Activates ESLS
1		X	Side Road A, 200m before intersection	X			1, 2, 3, 4
2	X		Side Road A, Stop line		X	X	1, 2, 3, 4
3		X	Side Road B, 200m before intersection	X			1, 2, 3, 4
4	X		Side Road B, Stop line		X	X	1, 2, 3, 4

TIMER SETTINGS

Detector	Call Timer (seconds)	Extend Timer (seconds)	Cancel Timer (seconds)
1	60	60	5
2	60	60	5
3	60	60	5
4	60	60	5

G3 – Example Op Sheet for complex

PROGRAM FOR SIDE ROAD ACTIVATED SPEED SITE

To: Installation Contractor
Responsible Maintenance Officer

From: **Date:**

Site: **Site No.:**

Region: **Municipality:**

***Modem IP Address:**

Remote web access IP and Port number:

Controller Port number

***Modem mobile number:** 123456789

***Controller Type:** Brand X

***Sign Type:** Brand X

Number of signs: 4

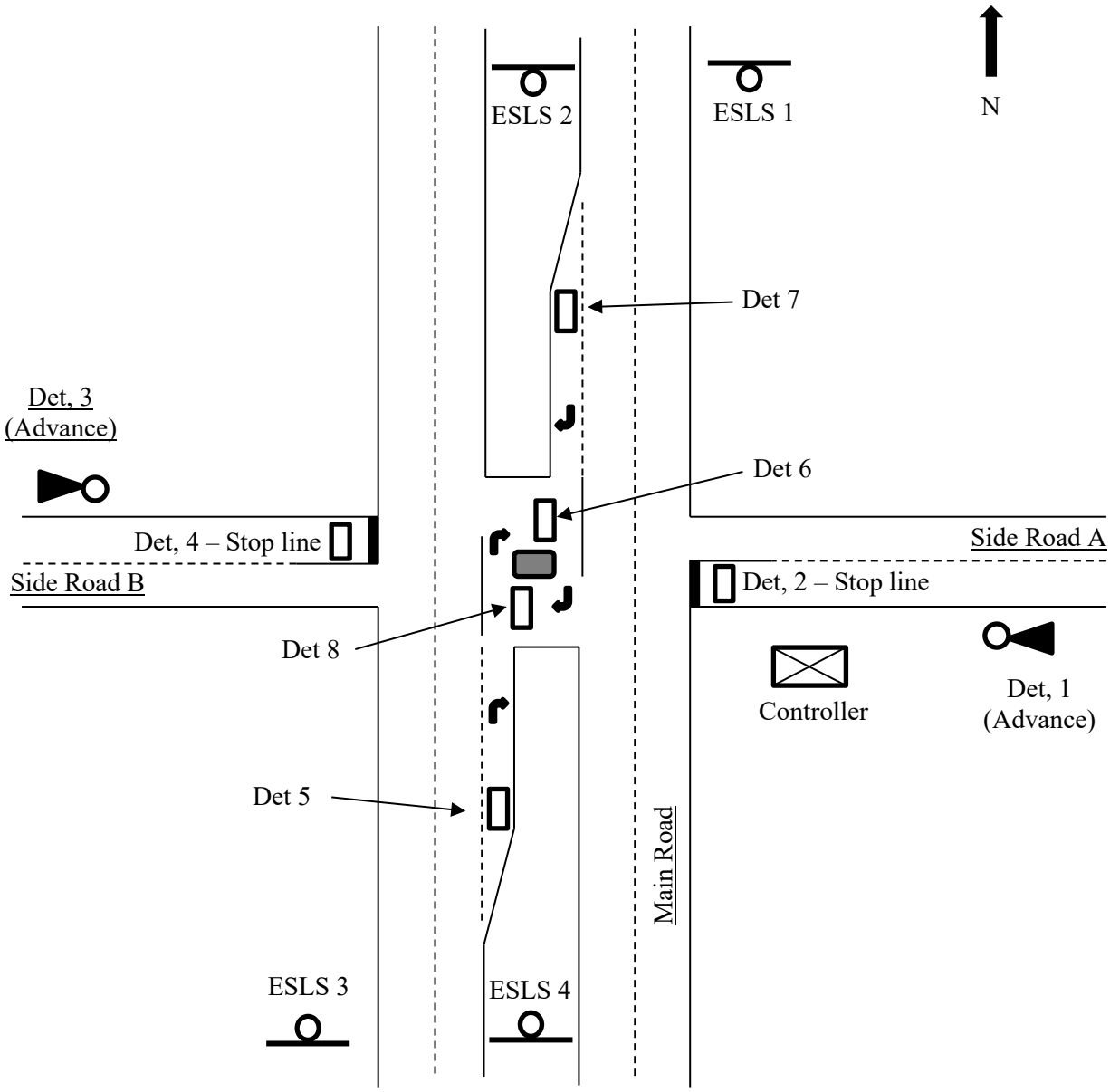
Number of detectors: 8

ELECTRONIC SPEED LIMIT SIGNS

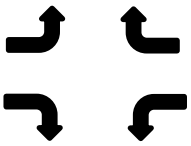
Sign	Speed Displayed	Location
1	80	Main Road, north approach, left side, 350m before intersection
2	80	Main Road, north approach, right side, 350m before intersection
3	80	Main Road, south approach, left side, 360m before intersection
4	80	Main Road, south approach, right side, 360m before intersection

* To be completed by installer

SITE SIGN AND DETECTOR MAP



Site Movements

	A, B, C or D	E2	F	
Movement				
Signs activated	1, 2, 3, 4	1, 2	3, 4	

Movement	Description	Call Detector	Extend Detector(s)
A	Left turn from Side Road A onto Main Road	1	2
B	Right turn or cross over from Side Road A onto Main Road	1	2 and 8
C	Left turn from Side Road B onto Main Road	3	4
D	Right turn or cross over from Side Road B onto Main Road	3	4 and 6
E	Right turn from Main Road onto Side Road A	5	6
F	Right turn from Main Road onto Side Road B	7	8

DETECTOR FUNCTIONS

Detector No.	*Loop*	*Radar*	Location	Call – Start Timer	Extend – Restart Timer	Cancel – Stop Timer	Activates ESLS
1		X	Side Road A, 200m before intersection	X			1, 2, 3, 4
2	X		Side Road A, Stop line		X	X	1, 2, 3, 4
3		X	Side Road B, 200m before intersection	X			1, 2, 3, 4
4	X		Side Road B, Stop line		X	X	1, 2, 3, 4
5	X		Main Road, south approach right turn slot	X			1, 2
6	X		Main Road, south approach, right turn stop line		X	X	1, 2
7	X		Main Road, north approach right turn slot	X			3, 4
8	X		Main Road, north approach, right turn stop line		X	X	3, 4

TIMER SETTINGS

Detector	Call Timer (seconds)	Extend Timer (seconds)	Cancel Timer (seconds)
1	60	60	5
2	60	60	5
3	60	60	5
4	60	60	5
5	60	60	5
6	60	60	5
7	60	60	5
8	60	60	5