ROADS AND MARITIME SERVICES

TRAFFIC SYSTEMS

SPECIFICATION NO. TSI-SP-059

TYPE 1 PORTABLE TRAFFIC SIGNALS SPECIFICATION

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1 SCOPE

1.1 General

This specification covers the requirements for RMS Type 1 portable traffic signal systems (Type 1 PTS) to be used in the state of NSW to control vehicular traffic, typically used to provide temporary control at short term roadworks. The Type 1 PTS only intends to be in partial compliance with the AS4191 [4] requirements.


1.2 Application

The Type 1 PTS is meant to be used where only short-term traffic control is required, with its unique application being defined in TTD2018/001 Technical Direction [6] and Traffic Control at Worksites Manual [7].

A Type 1 PTS is intended as a manually operated device, as a replacement for manual STOP/SLOW bats, for usage in scenarios where shuttle control and gating control are required for short durations of time. If unattended operation or long durations are required then a Standard PTS shall be used.

Since a Type 1 PTS is for using in place of STOP/SLOW bats; they can be used in three main configurations.

- Single display lantern controlled by an authorised Traffic Controller using a handheld remote controller, portable traffic signal unit.
- Two display lanterns controlled by an authorised Traffic Controller using a handheld remote controller, portable traffic signal group
- Two or more display lanterns, with each display lantern being controlled by an authorised Traffic Controller using a handheld remote controller, two or more portable traffic signal units.

2 REFERENCES AND APPLICABLE DOCUMENTS

2.1 Australian and International Standards


2.2 RMS Documents

2.3 Other Documents


3 DEFINITIONS AND GLOSSARY OF TERMS

For the purposes of this Specification, the following definitions and abbreviations shall apply:

Display Lantern – a 3 aspect (red, yellow, green) traffic lantern
HRC – Hand-held Remote Controller
Type 1 PTS – Portable Traffic (signal) System as defined in this specification TSI-SP-059, i.e. a HRC with one or two linked PTSU(s)
Portable – Transportable between sites, suited to being quickly set up on a new site.
PTSU – Portable traffic signal unit, a display lantern with its mechanical support
RMS – Roads and Maritime Services, a New South Wales government agency
Standard PTS – Portable Traffic (signal) System as defined in this specification TSI-SP-049
Traffic Controller – A trained personal whose duty is to control traffic at work sites. This control is normally exercised by the use of STOP/SLOW bats, but may be by manual control traffic signals or other device.
4 PORTABLE TRAFFIC SIGNAL SYSTEM COMPARISON

Attached is the key comparison of differences in features between the RMS Type 1 PTS and the RMS Standard PTS:

<table>
<thead>
<tr>
<th>Feature</th>
<th>Type 1 PTS</th>
<th>Standard PTS</th>
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</thead>
<tbody>
<tr>
<td>Operation</td>
<td>Manual</td>
<td>Manual/Unattended</td>
</tr>
<tr>
<td>Operator Controls</td>
<td>Hand-held Remote Controller</td>
<td>Hand-held Remote Controller, Local Control Panel</td>
</tr>
<tr>
<td>Battery Capacity</td>
<td>12 hours</td>
<td>Seven sun free days</td>
</tr>
<tr>
<td>Solar System</td>
<td>Not permitted</td>
<td>Optional</td>
</tr>
<tr>
<td>Mass of each PTSU</td>
<td>Suitable for manual handling</td>
<td>No limit</td>
</tr>
<tr>
<td>Target Board with White Border</td>
<td>Required</td>
<td>Required</td>
</tr>
<tr>
<td>Data Logging</td>
<td>Optional</td>
<td>Optional</td>
</tr>
<tr>
<td>Time Settings</td>
<td>Non-configurable (Yellow time four seconds)</td>
<td>Configurable</td>
</tr>
<tr>
<td>Dimming</td>
<td>Required</td>
<td>Required</td>
</tr>
<tr>
<td>Visors</td>
<td>Required</td>
<td>Required</td>
</tr>
<tr>
<td>Power</td>
<td>Batteries only</td>
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5 GENERAL REQUIREMENTS

5.1 Compliance to AS4191 Scope and General

The Type 1 portable traffic signal system shall comply with the requirement of Section 1 of AS4191:2015 [4].

5.2 Generic Compliance

All equipment and materials, where not otherwise specified, shall be in accordance with Australian Standards and RMS Specifications where such exist, and in their absence, with appropriate IEC and ISO Standards/Specifications.

5.3 Safety

The Type 1 portable traffic signal system shall comply with the requirements of the NSW Work Health and Safety Act [12].

5.4 Documentation

User manuals shall be compliant to TSI-SP-062 [11].

6 OPERATIONAL REQUIREMENTS
6.1 Control Types

The control types of Type 1 portable traffic signal system be compliant to Section 2.1 of AS4191:2015 [4].

6.2 Modes of Operation

Provision shall be made for the Traffic Controller to be able to set:

1. a single PTSU to green
2. all linked PSTUs to red
3. a single PSTU to flashing yellow
4. all linked PSTUs to flashing yellow

6.3 Manual PTS Control Method

The Type 1 PTS shall be controlled via a Hand-held Remote Controller (HRC), where onsite Traffic Controllers take local control of the Type 1 PTS. Feedback must be provided to the HRC and visually on the rear of the lantern for the Traffic Controller to adequately understand the display state of the Type 1 PTS they are controlling.

6.4 Start-Up Sequence Under Manual Mode of Operation

In the manual mode of operation, the Type 1 PTS shall be designed to start up in the following sequence:

a) Display a flashing yellow signal (see clause 6.5) for a period of five seconds on all Type 1 portable traffic signal units that are in use.

b) Display an all-red display on all Type 1 portable traffic signal units that are in use for a minimum of five seconds before a signal state change can be initiated by a Traffic Controller using the HRC.

6.5 Flashing Yellow

The red and green aspects shall remain blacked out when the PTSU is required to display flashing yellow. The yellow aspects shall flash (0.5 second on, ±10%) at a rate between 55 and 65 flashes per minute.

6.6 Sequence and Timing


The yellow interval shall be displayed for 4 seconds. The length of time that red and green shall be displayed will be controlled by the Traffic Controller using the HRC.

7 FUNCTIONAL REQUIREMENTS

7.1 Lantern Monitor

The Type 1 portable traffic signal system shall comply with the requirement of Section 3.3.2, of AS4191:2015 [4].
7.2 Lamp Monitoring

The Type 1 portable traffic signal system shall comply with the requirement of Section 3.4, of AS4191:2015 [4] with the amendment that the visual indication shall be on the HRC not at the master controller.

7.3 Operator Control

The Type 1 PTS shall only be operated via a Hand-held Remote Controller (HRC).

7.4 Control Requirements

Type 1 PTS shall comply with the requirements specified below:

a) Support all processing associated with the communications for the linked PTSU.
b) Ensure an all-red interval is in place before any green signal can be displayed.
c) Ensure an all-red interval is in place before a flashing yellow signal can be displayed.
d) Ensure that the requested signal is displayed on the correct PTSU and carries out all associated processing and monitoring functions.
e) Provide interlocking to ensure conflicting green/green displays cannot occur whilst utilising the shuttle control type.
f) Provide software interlocking to ensure opposing displays cannot occur whilst utilising the gating control type.
g) Ensure that the yellow time is set to four seconds and is not changeable.
h) Ensure that there is separation between test/setup mode and operation mode for the HRC and linked PTSU(s)
i) When the master control is switched off any linked PTSUs and automatically un-paired. Alternatively, a mechanism shall be provided for the a Traffic Controller using the HRC to identify unit 1 and unit 2.
j) Monitor, log (where required) and report the operation of each connected Type 1 Portable Traffic Signal individually.
k) Not allow signal state changes to be made by the operators until five seconds has elapsed since the start-up procedure has completed.
l) For operation allow the HRC to be linked to a single PTSU or a pair of PTSUs.
m) All components of the PTS should distinguish between valid commands and invalid commands and react accordingly.

7.5 Hand-held Remote Controller

The hand-held remote controller requirements shall be as follows:

a) HRC shall control linked PTSU(s) wirelessly.
b) HRC shall control linked PTSU(s) in a secure manner such that the linked PTSU(s) can only be controlled by the HRC they are inked to. Possible resolutions could include unique IDs, encrypted communications and / or other security arrangements.
c) The HRC will be capable of switching the Type 1 PTSU(s) on / off. The mechanism for on/off shall not be able to be executed accidentally, ie the on/off mechanism shall require to be activated for at least 3 seconds, but no more than 6 seconds.

d) The HRC shall provide a mechanism to initiate the start-up procedure on the Type 1 PTS as per Section 5.3.3.1. It shall only be active once the HRC has successfully paired to one or two PTSU(s).

e) The method of linking or pairing a PTSU shall require either:
   - a temporary wire connection, or
   - a secure wireless discovery and synchronisation.

f) The HRC shall provide a self-test button. The button shall test each paired signal unit by activating a signal test procedure that displays a green signal, yellow signal and red signal for 0.2-0.3 seconds each, in the listed order, followed by blanking the PTSU.

g) The HRC shall provide visual confirmation of the state of linked PTSU(s) as well as a fault alarm indicator for each PTSU. A fault alarm will trigger with the scenarios listed in section 8.1.

h) The HRS PTSU fault alarm indicator should be accompanied by an audible and/or vibration warning.

i) The HRC shall provide a battery level indicator and provide battery status information for the HRC and linked PTSUs.

j) The HRC shall indicate whether zero, one or two Type 1 Portable traffic signals are paired with the HRC.

7.6 Portable Traffic Signal Unit (PTSU)

The following requirements shall apply to the use of each PTSU:

a) PTSU cannot pair to multiple HRCs at the same time.

b) When power is connected to a PTSU, the default state shall remain blank until a command is received from the HRC.

c) After the start-up procedure has been completed the active aspect shall be red until five seconds has elapsed and a command to change the signal is received from the HRC.

d) PTSU shall be equipped with tilt and inclination sensors, which will raise a fault alarm indicator with the HRC when triggered.

7.7 Master / Slave Pairing

The Type 1 PTS shall support the following for master controller and slave pairing:

a) Each PTSU shall act as a Slave to commands from the master control (mandatory).

b) The HRC should act as the master control (preferred).

c) The master control may be located external to PTSU and the HRC.
7.8 COMMUNICATION REQUIREMENTS

7.8.1 Hand-held Remote Controller and Type 1 Portable Traffic Signals

Communication between the master controller, HRC and PTSUs shall be via a local wireless technology. Wireless communications shall be encrypted.

The manufacturer shall stipulate the maximum communication range between the PTSU and the master controller. Communication shall be reliable under all weather conditions up to the stated distance. It is desirable that the PTSU and the master controller can communicate over distances of a minimum of 100 m.

Where a signal change has been requested on a HRC, the signal change procedure shall be initiated within 250 ms of the request. The PTSU must acknowledge to the master that the signal change procedure has been initiated within 250 ms of the request being received.

Communications shall be in accordance with ACMA requirements.

7.8.2 Communication Timeout

A periodic communication polling message (heartbeat) shall be transmitted for the purposes of establishing whether a loss of communications has occurred. The heartbeat shall be sent every 1-3 seconds. When loss of communications has been detected by the master controller, an alert shall be raised on the HRC.

In the event that the master does not receive a response from a PTSU when a command is issued within 3 seconds the HRC shall provide an indication on the HRC.

In the event that a slave does not receive a heartbeat signal from the master within 125% of the nominated periodicity of the heartbeat the PTSU shall respond as specified in section 8.1.

7.8.3 Communications Integrity

The manufacturer must ensure that the HRC, master controller and PTSUs shall each have a unique communications ID, over the population of devices that the supplier manufactures, which shall be used to ensure messages are sent and received by individual units as intended.

Communications messages between the master controller, HRC and PTSUs shall be secure and/or encrypted to ensure integrity of the message information exchanged.

8 MONITORING, REPORTING AND FAULT REQUIREMENTS

8.1 Critical Fault Response

When a critical fault occurs, the Type 1 PTS shall go to an all-red display on all PTSUs within five seconds regardless of the control type.

a) The HRC shall display a visual indication of a fault condition and play an audible alarm that alerts the Traffic Controller.

b) The HRC shall set linked PTSU(s) to red.

c) Each PTSU shall go to a red display. The aspect that is currently green shall go to yellow for four seconds and then to a red display.
8.2 Critical Faults

In addition to Items c, g, i, j and k listed under Section 2.8.2 of AS4191:2015 [4], critical faults shall include the following:

a) movement of the PTSU after setting it into operation
   - monitored GPS location (where a GPS is installed) of the PTSU exceeding the installed location by 30m
   - monitored directional compass position of the PTSU exceeds installed position by + - 20 degree
   - tilting of the PTSU by more than 20º from the vertical
b) loss of communication
c) red aspect fault
d) the yellow is displayed for less than the required interval
e) conflicting green signals occurring in shuttle control
f) undefined behaviour or system crash.

8.3 Faults

In the event of a fault, the traffic controller shall be alerted via the HRC in use with a visual and audible alert on the HRC indicating the PTSU where the fault occurred.

Faults shall include the following:

a) low battery alarm (when less than 60 minutes of power remaining)
b) charging voltage too high – when the battery charge voltage exceeds the maximum charge voltage for the selected battery (for example, indicating a possible battery charge regulator problem)
c) green or yellow aspect fault

d) the yellow is displayed for less than the required interval

9 MECHANICAL AND PHYSICAL REQUIREMENTS

9.1 Weight

Each PTSU shall be suitable for manual handling as per the NSW Work, Health and Safety Act, either as a whole or suitably split into parts. It is intended as a lightweight device to ensure easy loading / unloading from a vehicle or trailer to the intended installation site by one or two persons.

9.2 Mounting

9.2.1 Barrow / Tripod Mounts

A Type 1 PTS shall have the capability to use ballast such as sandbags to stabilise the structure. The mechanical systems shall also ensure that the PTSU cannot rotate due to wind gusts up to the ultimate wind speed the structure is designed.

9.2.2 Mounting pole

The mounting pole shall have a height to the base of the signal lantern of 1.5 m to 2 m.
9.2.3 Dimensions

The dimensions for a Type 1 PTSU shall take into consideration the sizes of the individual components required to be supported by the barrow or tripod. Each PTSU is intended to be loaded and unloaded from a vehicle by up to two persons and therefore dimensions shall not exceed a size that will make this difficult or unsafe.

9.2.4 Battery, Controller and Communications Compartment

A Type 1 PTSU shall have a switch fitted externally to disconnect the battery from the PTSU. The switch shall be mounted so that it is not easily noticeable as such to the general public.

10 TRAFFIC SIGNAL LANTERN

10.1 Traffic Signal Lantern General

The Type 1 portable traffic signal system shall comply with the requirement of Section 4.1, Section 4.2 and Section 4.3 of AS4191:2015 [4].

10.2 Target Boards

Target boards are required for Type 1 PTS as per Section 4.4 of AS2144:2014 [1], with boarder requirement as per Clause 7.3 of TSI-SP-045 Issue 2.0 [9].

10.3 Dimming

Dimming is required for Type 1 PTS as per Section 6.5 of AS4191:2015 [4].

10.4 Visors

Visors are required for Type 1 PTS as per Section 4.5 of AS4191:2015 [4], and as per Clause 7.2 of TSI-SP-045 Issue 2.0 [9].

11 POWER SUPPLY

11.1 Power General

The Type 1 portable traffic signal system shall be powered from batteries.

11.2 Low-Voltage Cut-Off

The Type 1 portable traffic signal system shall comply with the low-voltage cut-off requirement of Section 6.2 of AS4191:2015 [4].

The Battery health shall be monitored and facilities in place to aid users in managing battery health, eg monitoring depth of discharge and switching off at a suitable time with suitable notification to operators.

11.3 Batteries

The Type 1 portable traffic signal system shall comply with the requirement of Section 6.5 of AS4191:2015 [4].
Type 1 PTS shall be powered from batteries, and batteries must have capacity for a minimum of 12 hours of continuous operation.

Note: Manufacturers should ensure that there is spare capacity to allow for battery degradation.

11.4 Power for Hand-held Remote Control

The hand-held remote control shall be powered from batteries.

a) The battery can operate the connected load for a minimum of 12 hours of continuous operation under normal usage conditions.

b) The HRC shall have a facility that allows the battery to be charged without interrupting the current operation of the HRC.

c) Battery health shall be monitored and facilities in place to aid users in managing battery health, eg monitoring depth of discharge and switching off at a suitable time with suitable notification to operators.

d) The battery used shall have a cycle life of at least 800 cycles.

12 ENVIRONMENT REQUIREMENT

The Type 1 portable traffic signal system shall comply with the requirement of Section 7 of AS4191:2015 [4], except Section 7.3.

12.1 Wind Loading

Any use of ballast to increase the capability of the PTSU to withstand the subjected wind speed shall be clearly and explicitly detailed in the equipment Manuals. The manufacturer shall stipulate the maximum wind speed that the Type 1 PTSU can be subjected to and the associated ballast requirements.

13 STATUTORY REQUIREMENT CERTIFICATION AND LABELLING

The equipment shall be certified for applicable statutory requirements such as for:

a) Electrical safety; including AS 3000 [1] and AS3820 [3].

b) Electromagnetic compatibility;

b) Radio communications (if wireless communications are used).

Certified equipment shall be labelled as specified under statutory regulations, with the applicable regulatory compliance labels.

14 QUALITY ASSURANCE AND CONTROL

14.1 Quality System

The Supplier and the manufacturer shall operate a quality management system complying with ISO 9001 [5], certified by an accredited quality management system certification body.
14.2 Quality Plan

The manufacturer shall document and provide a quality plan including details of quality control tests, sampling, and records to be made by the manufacturer during manufacture and release. A copy of this quality plan shall be provided to RMS as part of the approval process. Acceptance of this quality plan by RMS is a prerequisite to gaining overall approval.

14.3 Quality Audits

RMS reserves the right to examine the Manufacturer's quality records pertaining to an order that is on behalf or RMS. RMS also reserves the right to arrange for an independent quality audit concerning items in contract.

15 APPROVAL

15.1 Approval Process

To gain approval of the Type 1 Portable traffic signal system, the supplier shall follow the process defined in TS201 [8].

If requested by RMS, the supplier shall provide a sample Type 1 PTS system together with accessories, for RMS to evaluate.

Regarding wind capability, the supplier shall state whether they are seeking approval to cover Region B in addition to Region A, (or other terrain categories) and provide evidence accordingly. Approval, if granted, will be limited to regions and terrain for which capability has been demonstrated and accepted.