

Superseded

Technical Specification

**Transport and Main Roads Specifications
MRTS254 Portable Traffic Signals**

July 2017

Superseded

Copyright



<http://creativecommons.org/licenses/by/3.0/au/>

© State of Queensland (Department of Transport and Main Roads) 2017

Feedback: Please send your feedback regarding this document to: tmr.techdocs@tmr.qld.gov.au

Contents

- 1 Introduction1**
- 2 Definition of terms1**
- 3 Reference documents2**
- 4 Quality system requirements3**
 - 4.1 Samples for acceptance 3
- 5 Operational requirements3**
 - 5.1 General operation 3
 - 5.2 PTSS control methods 4
 - 5.3 PTSS start-up sequence..... 4
 - 5.3.1 *Start-up interlocks*.....4
 - 5.3.2 *Manual mode of operation*.....4
 - 5.4 Reliability..... 5
 - 5.5 Portable Traffic Signal System comparison..... 5
- 6 Functional requirements5**
 - 6.1 Operator controls 5
 - 6.2 Controller requirements 5
 - 6.3 Hand-held remote controller (Type-1) 6
 - 6.4 Portable traffic signal unit (Type-1)..... 6
 - 6.5 PTSS master / Slave pairing (Type-1)..... 7
- 7 Communication requirements8**
 - 7.1 Hand-held remote controller and Portable Traffic Signals..... 8
 - 7.2 Communications timeout 8
 - 7.2.1 *Type-1* 8
 - 7.2.2 *Type-2* 8
 - 7.3 Communications identifiers..... 9
 - 7.3.1 *Portable Traffic Signal System ID*9
- 8 PTSS monitoring, reporting and fault requirements9**
 - 8.1 Faults (Type-1)..... 9
 - 8.1.1 *Critical faults (Type-1)*9
- 9 Mechanical and physical requirements 10**
 - 9.1 General 10
 - 9.2 Design life 10
 - 9.3 PTS mounting 10
 - 9.3.1 *Barrow / Tripod mounts* 10
 - 9.3.2 *Trailer mounts*..... 11
 - 9.3.3 *Surface finishes* 11
 - 9.3.4 *Mounting pole* 11
 - 9.3.5 *Dimensions*..... 11
 - 9.3.6 *Wind loading*..... 11
 - 9.3.7 *Battery, controller and communications compartment*..... 12
 - 9.3.8 *Stabilisers* 12
 - 9.4 Traffic signal lantern 12

9.4.1	<i>Target boards</i>	12
9.4.2	<i>Visors</i>	12
9.5	Hand-held remote controller	13
10	Electrical requirements	13
10.1	Portable traffic signal lanterns	13
10.1.1	<i>Supply voltage</i>	13
10.1.2	<i>Dimming</i>	13
10.2	Solar panel array	13
10.3	Batteries.....	13
10.3.1	<i>Portable Traffic Signal System</i>	13
10.3.2	<i>Hand-held remote control (Type-1)</i>	14
10.3.3	<i>Battery charger</i>	14
11	Portable traffic signal lantern photometric performance	14
11.1	Operations and maintenance manual.....	14
12	Testing, commissioning and configuration requirements	15
13	Warranty provisions	16
14	Training requirements	16
15	Maintenance requirements	16
16	Handover requirements	16

Superseded

1 Introduction

This Technical Specification defines the design, supply, installation, testing and commissioning, performance, documentation, training, maintenance and handover requirements for Portable Traffic Signals Systems. This Technical Specification shall be read in conjunction with MRTS01 *Introduction to Technical Specifications*, MRTS50 *Specific Quality System Requirements*, MRTS201 *General Equipment Requirements*, Queensland *Manual of Uniform Traffic Control Devices (MUTCD) Part 3 Works on Roads* and other Technical Specifications as appropriate.

Portable Traffic Signal Systems complying with this Technical Specification shall only be used in accordance with the operational requirements of the MUTCD Part 3, Supplement 4.11-1.

This Technical Specification forms part of the Transport and Main Roads Specifications Manual.

2 Definition of terms

The terms defined in MRTS201 *General Equipment Requirements* apply to this Technical Specification. Additional terminology relevant under this Technical Specification are defined in Table 2 below.

Table 2 – Definitions

Term	Definition
Approach	That section of road, consisting of one or more lanes, used by vehicles approaching an intersection or mid-block site.
Display	A signal aspect that is illuminated.
Fixed Time operation	A signal operation mode that allows for only a fixed sequence and fixed duration of displays.
Flashing yellow operation	A signal operation mode where the yellow aspects continually flash.
Manual operation	A signal operation method that allows each phase to be individually controlled by manually entering a demand for the next phase.
Master controller	The internal control processing unit hardware within the Master PTS unit which undertakes all communication and internal processing tasks required for operation. This controller controls the Slave controller operations.
NATA	National Association of Testing Authorities, Australia.
Operation Modes	PTSS operation modes include manual, fixed time, vehicle actuated and flashing yellow.
Portable Traffic Signal Unit (PTSU)	An individual portable traffic signal that consists of the traffic signal lantern, battery, communications equipment, mounting assembly and base.
Portable Traffic Signals System (PTSS)	Traffic light signals and associated equipment that provides signalling for temporary control of traffic at work sites.
RPEQ	Registered Professional Engineer of Queensland.
Hand-held Remote Controller (HRC)	A hand-held remote / device which can control and set the PTSS lanterns at a safe distance. This device may be wired or wireless.

Term	Definition
Slave controller	The internal control processing unit hardware within the slave PTSU which undertakes all communication and internal processing tasks required for operation. This unit is subservient to the Master controller to which it is linked.
TMR	Department of Transport and Main Roads
Traffic Controller	A person authorised to control traffic movements through site works by means of flags, stop / slow bats or other equipment.
Vehicle actuated operation	An operation mode that allows a variable sequence and variable duration of signal displays depending on vehicle (and pedestrian) traffic demands. All vehicle movements (phases) are actuated in fully-actuated operation in contrast with semi-actuated operation where only minor vehicle movements (e.g. side traffic) are actuated.
Yellow Time	Duration of the yellow signal for a phase or movement. This is static and pre-specified.

3 Reference documents

The requirements of the referenced documents listed in Table 3 of MRTS201 *General Equipment Requirements* and Table 3 below apply to this Technical Specification. Where there are inconsistencies between this Technical Specification and referenced MRTS documents, the requirements specified in this Technical Specification take precedence.

Table 3 – Referenced Documents

Reference	Title
AS 1170.2	<i>Structural Design Actions Part 2: Wind Actions</i>
AS 2144	<i>Traffic Signal Lanterns</i>
AS 2700	<i>Colour Standards for General Purposes</i>
AS 4191	<i>Portable Traffic Signal Systems</i>
AS 4509.1	<i>Stand-alone Power Systems – Safety and Installation</i>
AS 4509.2	<i>Stand-alone Power Systems – System Design</i>
AS 60529	<i>Degrees of Protection Provided by Enclosures (IP Code)</i>
AS/NZS 5033	<i>Installation and Safety Requirements for Photovoltaic (PV) Arrays</i>
AS/NZS CISPR 22	<i>Information Technology Equipment - Radio Disturbance Characteristics – Limits and Methods of Measurement</i>
MRTS02	<i>Provision for Traffic</i>
MRTS50	<i>Specific Quality System Requirements</i>
MRTS61	<i>Mounting Structures for ITS Devices</i>
MRTS201	<i>General Equipment Requirements</i>
MUTCD Part 3	<i>Queensland Manual of Uniform Traffic Control Devices (MUTCD) – Part 3 Works on Roads</i>
MUTCD Part 3, Supplement 4.11-1	<i>Manual of Uniform Traffic Control Devices (MUTCD) – Part 3 - Supplement 4.11-1 Portable Traffic Signals</i>

4 Quality system requirements

The quality system requirements defined in MRTS201 *General Equipment Requirements* apply to this Technical Specification. Additional quality system requirements relevant under this Technical Specification are defined in Table 4. There are no Milestones defined.

Table 4 – Hold Points, Witness Points and Milestones

Clause	Hold Point	Witness Point	Milestone
4.1	1. Samples for acceptance (design) 2. Photometric performance certification		
9.1	3. Barrow, tripod or trailer support structure design documentation		
10	4. Detailed design documentation of the electrical wiring including solar and charging assembly and calculations, signed by RPEQ.		
12		1. Factory Acceptance Test 2. PTSS Demonstration 3. ACMA Compliance 4. Site Acceptance Test	

4.1 Samples for acceptance

The requirements of MRTS201 apply to this Technical Specification.

A sample PTSS for acceptance and photometric performance certification shall be provided 28 days prior to manufacture. **Hold Point 1**

Detailed designs of the PTSS layout, fabrication and assembly drawings, calculations, specifications and certifications of the PTSS and associated components (signed by the Contractor's RPEQ) shall be submitted to the Principal via the Administrator for verification prior to manufacture.

Photometric performance testing methodology and NATA certification confirming the PTSS performance requirements specified in this Technical Specification shall be submitted before delivery to site. **Hold Point 2**

5 Operational requirements

5.1 General operation

The use of all PTSSs shall be in accordance with MUTCD *Part 3, Supplement 4.11-1 Portable Traffic Signals*. The Department of Transport and Main Roads has permitted the use of two types of PTSSs as per Table 5. A Type-2 PTSS shall comply with the requirements prescribed in AS 4191 and any additional requirements specified in this document.

Table 5 – Permitted PTSS Types

PTSS Type	Description
Type-1	The Type-1 PTSS is intended for use where only short-term traffic control is required.
Type-2	The Type-2 PTSS is intended as a device that complies with the requirements in AS 4191.

5.2 PTSS control methods

PTSS control methods such as manual operation, fixed time operation, vehicle actuated operation and flashing yellow operation shall be in accordance with MUTCD Part 3, Supplement 4.11-1.

The PTSS shall be operated through the listed methods in Table 5.2 below:

Table 5.2 Permitted PTSS control methods

Control Method	Permitted PTSS Type
Hand-held Remote Controller (HRC) – Where onsite personnel take local control of the PTSS	1, 2
Maintenance Port for a connected laptop or other device with maintenance and configuration software – at the PTSS	2
Local Control Panel – Where onsite personnel configure and take manual control of the PTSS	2

5.3 PTSS start-up sequence

The PTSS start-up sequence shall not take place until the PTSS has undergone a complete system check to establish that all components are functional, including a self-test of each lantern and that the communication system has been established and verified working to all PTSUs and the master controller.

5.3.1 Start-up interlocks

Equipment shall be provided with interlocks to prevent the PTSS from operating in other than the flashing yellow mode unless all of the essential modules are correctly fitted.

5.3.2 Manual mode of operation

5.3.2.1 Type-1 start-up sequence

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

- a) Display a flashing yellow signal (0.5 second on and off) for a period of five seconds on all portable traffic signals that are in use.
- b) Display an all-red display on all portable traffic signals that are in use for a minimum of five seconds before a signal state change can be initiated by an operator.

5.3.2.2 Type-2 start-up sequence

In the manual mode of operation, the Type-2 PTSS shall be designed to start up as per AS 4191.

5.4 Reliability

All PTSS shall have a high availability with a minimum of 99.9% operating reliability over the lifetime of the system.

5.5 Portable Traffic Signal System comparison

A comparison table of the major differences between the systems are listed in Table 5.5 below.

Table 5.5 – PTSS comparison table

Feature	Type-1	Type-2
Operation	Manual	Manual/Unattended
Operator Controls	HRC	HRC, Local Control Panel
Battery Technology	Lithium iron phosphate	Lithium iron phosphate, Lead-acid, Nickel-cadmium.
Battery Capacity	12 hours	Seven sun free days
Solar System	Not Permitted	Required
Mass of each PTSU	25 kg	No limit
Target Board	Optional	Required
Data Logging	Optional	Optional
Time Settings	Non-configurable (Yellow time four seconds)	Configurable

A Type-1 PTSS is intended as a manually operated device 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 Type-2 device must be used.

6 Functional requirements

The functional requirements of a Type-1 PTSS shall comply with the following sections in this document and MUTCD *Part 3 Supplement 4.11-1*. A Type-2 PTSS shall comply with AS 4191, the MUTCD *Part 3 Supplement 4.11-1* and clauses in this document specifically referring to Type-2 systems.

6.1 Operator controls

A Type-1 PTSS shall only be operated via a HRC. Type-2 PTSS shall be operator controls shall be in accordance with AS 4191.

6.2 Controller requirements

Controller requirements for a Type-2 PTSS shall be in accordance with AS 4191. A Type-1 PTSS shall comply with the requirements specified below:

- a) Support all processing associated with the communications for the paired Portable Traffic Signals.
- b) Ensure an all-red interval is in place before any green signal can be displayed.

- c) Ensure that the requested signal is displayed on the correct Portable Traffic Signal and carries out all associated processing and monitoring functions.
- d) Provide software interlocking to ensure conflicting green/green displays cannot occur whilst utilising the shuttle control type.
- e) Provide software interlocking to ensure opposing displays cannot occur whilst utilising the gating control type.
- f) Ensure that the yellow time is set to four seconds and is not changeable.
- g) Monitor, log (where required) and report the operation of each connected Portable Traffic Signal individually.
- h) Not allow signal state changes to be made by the operators until five seconds has elapsed since the start-up procedure has completed.
- i) Allow Portable Traffic Signals to be controlled individually or as a pair when in operation.
- j) Accept valid commands and reject invalid commands.

6.3 Hand-held remote controller (Type-1)

Operation of a Type-1 PTSS is via an HRC.

The following requirements shall apply to the use of the HRC:

- a) If HRC is wireless, it shall transmit with a unique ID and / or other security arrangements to ensure that the PTSUs paired with that PTSS can only be changed by the paired HRC.
- b) The HRC will be capable of switching the PTSS displays on / off. The PTSS displays shall only be shut-down once the start-up / shut-down button is pressed and held for five seconds. After five seconds the displays will turn off and all aspects shall be blank.
- c) The HRC shall provide a button to initiate the start-up procedure on the PTSS as per Section 5.3.3.1. It shall only be active once the HRC has successfully paired to one or two PTSU(s).
- d) The HRC shall have a facility to allow the operator to select which PTSUs to pair / connect to.
- e) 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, red signal and a blank signal for 0.1-0.2 seconds each and in the listed order.
- f) The HRC shall provide visual confirmation of the state of both PTSUs as well as a fault alarm indicator (with audible warning) for each PTSU. A fault alarm will trigger with the scenarios listed in Section 8.2.
- g) The HRC shall provide a battery level indicator and provide battery status information for the HRC and both PTSUs.
- h) The HRC shall indicate whether zero, one or two portable traffic signals are paired with the HRC.

6.4 Portable traffic signal unit (Type-1)

The following requirements shall apply to the use of each Type-1 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 start-up 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) A Type-1 PTSU shall be equipped with tilt and inclination sensors.

6.5 PTSS master / Slave pairing (Type-1)

The PTSS shall support one of these configurations for master controller and slave pairing:

- a) The Master shall be located external to each Slave PTSU and the HRC (Figure 6.5(a)).
- b) Each of the PTSUs shall act as a Slave and the HRC shall act as a Master (Figure 6.5(b)).
- c) One of the PTSUs shall act as a Master and the other shall act as a Slave (Figure 6.5(c)).

Figure 6.5(a) – PTSS Pairing Arrangement 1

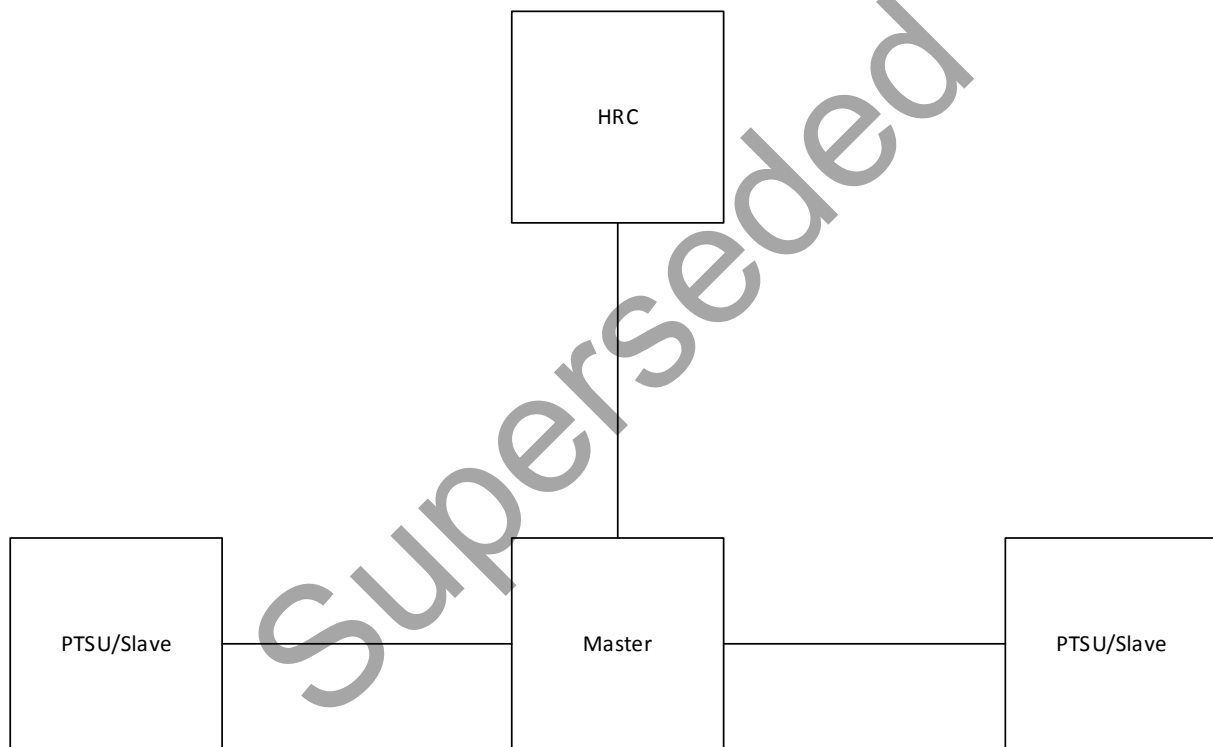


Figure 6.5(b) – PTSS Pairing Arrangement 2

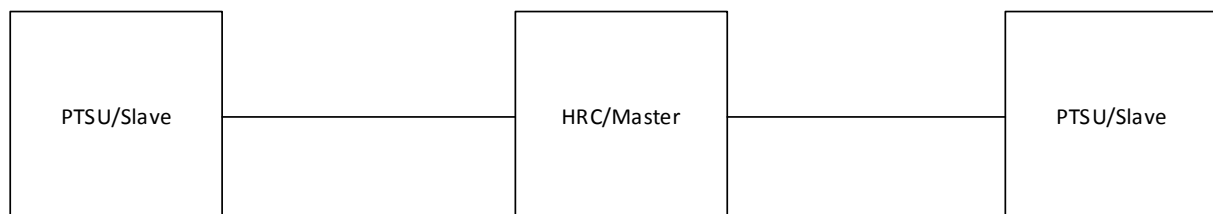
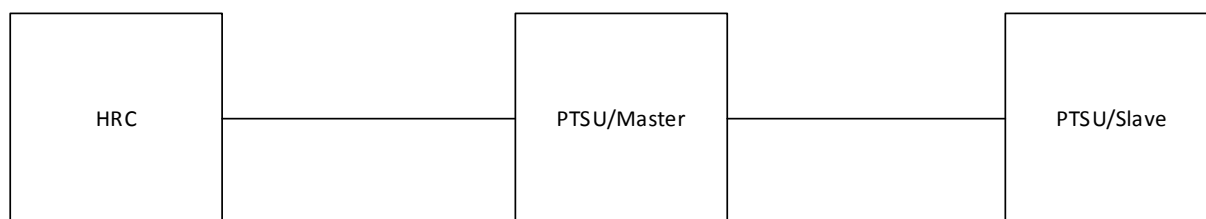


Figure 6.5(c) – PTSS Pairing Arrangement 3



7 Communication requirements

Requirements for the PTSSs communication system is below. Type-2 PTSSs shall comply with the requirements in AS 4191 Section 1.4 and the Australian Communications and Media Authority (ACMA) in addition to Clause 7 of this document.

7.1 Hand-held remote controller and Portable Traffic Signals

Communication between the master controller, HRC and PTSUs shall be via a local wired connection or a wireless technology such as Ultra-High Frequency (UHF) radio band or other reliable 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 1000 m.

Periodic two-second communications (time-out period) polling message (heartbeat) shall be transmitted for the purposes of establishing whether a loss of communications has occurred. When a command is issued, a heartbeat message shall be broadcast. When loss of communications has been detected by the master controller, an alert shall be raised on the HRC.

Where a signal change has been requested on a PTSU, 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.

7.2 Communications timeout

7.2.1 Type-1

In the event that a slave does not receive an acknowledgement from the master within two seconds of the heartbeat signal being sent:

- The PTSU shall go to an all-red display. The aspect that is currently green shall go to yellow for four seconds and then to a red display until communication is re-established and a command is able to be issued by the traffic controller.
- The HRC shall display a visual indication of the communications loss and play an audible alarm that alerts the traffic controller.

7.2.2 Type-2

If communications are disrupted with a Type-2 PTSS, the device shall comply with the requirements prescribed in Section 2.8.2 of AS 4191.

7.3 Communications identifiers

The HRC, master controller and PTSUs shall each have a unique communications ID 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 include a checksum that is based on the message information exchanged to ensure integrity of the communication is upheld.

7.3.1 Portable Traffic Signal System ID

Any communications messages transmitted shall embed each PTSU's respective ID.

8 PTSS monitoring, reporting and fault requirements

The monitoring, reporting and fault requirements for a Type-1 PTSS are below. A Type-2 PTSS shall comply with the requirements prescribed in AS 4191.

8.1 Faults (Type-1)

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 and 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) loss of solar module (where installed)
- d) green or yellow aspect fault
- e) critical faults.

8.1.1 Critical faults (Type-1)

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

In addition to Items c, d, f, g, i and j listed under Section 2.8.2 of AS 4191, critical faults shall include the following:

- a) movement of the PTSU after installation, detected through:
 - monitored GPS location (where a GPS is installed) of the PTSU exceeding the installed location by 30 m
 - monitored directional compass position of the PTSU exceeds installed position by +/- 20 degrees (yaw)
 - monitored inclination of the PTSU exceeds installed position by ± 20 degrees (roll or pitch).
- b) loss of communication
- c) red aspect fault

- d) conflicting green signals occurring in shuttle control
- e) opposing signals occurring in gating control
- f) undefined behaviour or system crash.

9 Mechanical and physical requirements

9.1 General

The mechanical and physical requirements defined in MRTS201 *General Equipment Requirements* and MRTS61 *Mounting Structures for ITS Devices* apply to the PTSS and associated control electronics defined by this Technical Specification. Portable traffic signal lanterns shall be capable of being mounted on a pole that connects to a barrow, tripod or trailer support structure.

All compartments that contain any electronic components shall have an ingress protection rating of at least IP45 as defined in AS 60529. A certificate or letter of compliance from a NATA approved testing facility shall be made available to the department upon request.

Support structure design documentation for Type-1 and Type-2 devices, shall be submitted to the Principal's representative for acceptance 28 days prior to manufacture. **Hold Point 3**

The PTSS shall be constructed from durable materials to enable installation and reliable operations.

Each PTSU of a Type-1 PTSS shall not exceed 25 kg.

A Type-1 PTSS 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 Design life

Unless otherwise specified, the design life of components shall be as follows:

- a) PTSS mechanical components and structure: a minimum of 20 years.
- b) PTSS and HRC electrical components and systems: a minimum of 10 years.
- c) Lantern body, structural supports and any mechanical accessories, including any protective coatings, are designed for a service life of at least 20 years.

9.3 PTS mounting

The vehicle on which the PTS is mounted or stored shall conform to the requirements of the host vehicle specified in AS 4191 (for Type-2 PTSS) and this Technical Specification.

9.3.1 Barrow / Tripod mounts

Where the PTSU is mounted on a barrow or tripod (Figure 9.3.2), the portable traffic signal shall have a mechanical system which allows the portable traffic signal to be safely secured for transportation.

The mechanical system shall also allow for the PTSU to be safely erected on site to ensure the unit is clearly visible. A Type-1 PTSS shall have the capability to use a 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.

9.3.2 Trailer mounts

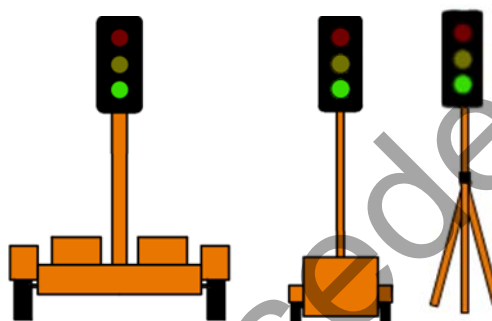
Where the PTSS is mounted on a trailer (Figure 9.3.2), the PTSU and solar panel array (if applicable) shall have a mechanical system which allows the PTSU and solar panel to be safely secured to the trailer for transportation.

The mechanical system shall also allow for the PTSU and solar panel to be safely erected on site and the solar panels shall be adjustable to ensure optimum solar exposure and maximum energy generation anywhere in Queensland.

The mechanical systems shall ensure that the portable traffic signal cannot rotate due to wind gusts up to the ultimate wind speed that the structure is designed for.

The trailer shall comply with the applicable Australian Design Rules and shall be suitable for registration in accordance with the statutory requirements of the State of Queensland.

Figure 9.3.2 – Example Portable Traffic Signal Unit Mountings (for illustrative purposes only)



9.3.3 Surface finishes

The external finishes of equipment items shall be resistant to corrosion. All metal surfaces shall be painted in the range of high visibility colours from X15 Orange to X13 Marigold as specified in AS 2700. All surface finishes of PTSSs shall comply with AS 4191. The finish of lanterns, target boards and visors shall comply with AS 2144.

9.3.4 Mounting pole

The mounting pole for a Type-1 PTSU shall have a height to the base of the signal lantern of 1.5 m to 2 m. A Type-2 PTSU shall comply with the lantern mounting height requirements prescribed in the MUTCD Part 14, Section 5.2.

9.3.5 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.

A Type-2 PTSU shall not exceed dimensions that are unsafe or impractical to mount on a trailer.

9.3.6 Wind loading

A Type-1 PTSS shall be designed to maintain its intended orientation and position when subjected to winds of 26.3 m/s. Ballasts such as sandbags can be used to increase stability of each PTSU and any associated components. The manufacturer shall stipulate the maximum wind speed that the PTSS can be subjected to and any ballast requirements.

For a Type-2 PTSS, all components of the PTSS shall be designed and certified by a suitably qualified RPEQ to ensure that the PTSS will maintain its intended orientation and position when subjected to the wind loading conditions of the region in which the PTSS is intended to be deployed, in accordance with AS 1170.2.

9.3.6.1 Vehicle induced turbulence

The PTSS shall be designed to ensure that PTSU will maintain its intended orientation and position when subject to vehicle induced turbulence from B-double heavy vehicles at up to 70 km/h.

9.3.7 Battery, controller and communications compartment

The storage compartment shall incorporate room for a battery, communications and controller components. The compartment shall be key lockable and comply with applicable OH&S regulations and requirements.

Any storage compartments shall have dust and moisture ingress protection of at least IP45.

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 accessible to the general public.

9.3.8 Stabilisers

The PTSS shall be suitably designed to ensure stability of each PTSU when positioned on site. The type of stabilisers shall:

- a) allow for swivel
- b) be located on the four corners of the trailer or barrow (where a trailer or barrow is used), have fixed locations engineered to stabilise the barrow, trailer or tripod with the PTSU fully extended while meeting wind loading conditions
- c) be wind-down and readily storable for safe and secure moving
- d) have a load rating sufficient for levelling of the PTSU, and
- e) have a locking mechanism with removable handles and secure drive nuts.
- f) A Type-1 PTSS can use sandbags to increase stability.

9.4 Traffic signal lantern

The traffic signal lantern requirements indicated below specifically refer to the physical lantern and not the electronic or optical performance requirements.

The traffic signal lantern and associated control electronics shall comply with the relevant requirements of MRTS201 *General Equipment Requirements*. All physical requirements of the lantern shall comply with AS 2144 unless otherwise specified.

9.4.1 Target boards

It is not a requirement for Type-1 PTSSs to be equipped with target boards. Type-2 PTSSs shall use target boards in accordance with AS 4191. Target boards shall be manufactured from aluminium.

9.4.2 Visors

Each aspect of each lantern shall be fitted with a visor in accordance with the requirements of AS 2144.

9.5 Hand-held remote controller

The hand-held remote controller shall be lightweight, have a ruggedised construction, and be resistant to mishandling, shock and vibrations. The HRC shall have an ingress protection rating of at least IP65 as defined in AS 60529.

10 Electrical requirements

The electrical requirements of MRTS201 apply to this Technical Specification unless otherwise specified. Additional electrical requirements for equipment provided under this Technical Specification are given below.

Detailed designs of the electrical wiring and, if applicable, solar and charging assembly shall be reviewed and signed by the Contractor's RPEQ. They shall then be submitted and approved by the Principal or their delegate for verification and acceptance. **Hold Point 4**

10.1 Portable traffic signal lanterns

The electrical requirements of traffic signal lantern aspects used in PTSSs shall be in accordance with the requirements of AS 2144, unless otherwise specified.

Only three aspect (green, yellow, red) LED lanterns shall be used.

10.1.1 Supply voltage

The PTSS shall only use traffic signal lantern aspects that are 12V Direct Current (D.C.) lanterns as per AS 2144.

10.1.2 Dimming

Dimming is not a requirement for a Type-1 PTSS. Type-2 PTSSs shall comply with the requirements set in AS 4191.

10.2 Solar panel array

This section applies to all PTSSs that use solar systems. Solar systems are not permitted in Type-1 PTSSs. In Type-2 PTSSs, solar systems are required.

The selection, configuration, installation and testing of solar panel modules shall be consistent with AS 4509.1, AS 4509.2 and AS/NZS 5033. Additionally, Type-2 solar panel arrays shall be compliant with the requirements in AS 4191.

All solar panel module fittings and adjustments shall be designed, manufactured and tested with appropriate theft prevention methods.

The solar panel size shall not exceed the barrow or trailer footprint intended for PTSU mounting.

10.3 Batteries

10.3.1 Portable Traffic Signal System

The Type-1 PTSS shall be powered from batteries. Type-2 PTSSs shall be powered by solar, batteries and / or via a generator in accordance with AS 4191. The battery technology used in a Type-1 PTSS shall be lithium iron phosphate (LiFePO₄) or an allowable battery technology for a Type-2 PTSS as per AS 4191 and subject to the following additional conditions:

- a) Devices can operate the connected load for a minimum of 12 hours of continuous operation (Type-1) or can operate the connected load for a minimum of seven sun free days (Type-2).

- b) Type-1 devices shall have a facility that allows the battery to be charged without interrupting the current operation of the PTSS.
- c) Depth of Discharge (DOD) cannot exceed 80%.
- d) Batteries shall be installed to minimise the risk of:
 - i. impact by a motor vehicle
 - ii. theft or vandalism
 - iii. explosion.

Suitable circuit protection shall be fitted between the battery and any connected load. The circuit protection shall be appropriately sized for the rated load.

A switch shall be fitted to safely disconnect the battery from the load in the event of a catastrophic failure or incorrect signal display.

10.3.2 Hand-held remote control (Type-1)

The hand-held remote control shall be powered from batteries. The battery technology used shall be lithium iron (Li-ion) and subject to the following additional conditions:

- 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) Depth of Discharge (DOD) cannot exceed 50%.
- d) The battery used shall have a cycle life of at least 800 cycles.

10.3.3 Battery charger

All battery chargers shall be connected to the battery bank by fixed wiring via the main battery fuse or circuit breaker. If the main battery fuse or circuit breaker will not provide overcurrent protection for the battery charger output wiring, the battery charger output cabling shall be protected from overcurrent by separate HRC fuse or a D.C. rated circuit breaker adjacent to the main battery fuse or circuit breaker. The battery charger shall be fitted with a fuse or circuit breaker to provide an isolating point and battery charger overcurrent protection.

11 Portable traffic signal lantern photometric performance

The photometric performance of signal lanterns used with a PTSS shall meet the parameters defined in AS 2144. A NATA accredited test report must be provided to the department to ensure photometric compliance.

11.1 Operations and maintenance manual

Each PTSS shall be supplied with an operations and maintenance manual detailing how to safely use the system. As a minimum it shall detail:

- a) safe transportation of the PTSU
- b) on-site installation
- c) suitable locations for installation

- d) setting up of the PTSS for operation
- e) HRC operation
- f) starting up
- g) shutting down
- h) safe manual handling procedures for the batteries
- i) routine and preventative maintenance
- j) troubleshooting
- k) Workplace Health and Safety (WH&S) requirements
- l) specific details and calculations of the battery size. If a solar system is used, this documentation shall contain all the applicable elements provided in the worked example of Appendix A of AS 4509.2. The manufacturer specification sheet of the photovoltaic array, batteries and battery charger / regulator shall be provided.

12 Testing, commissioning and configuration requirements

After the PTSS is first built and before being used on site, a Factory Acceptance Test (FAT) shall be completed in accordance with the requirements of this Technical Specification. **Witness Point 1**

The PTSS shall be demonstrated to the satisfaction of the Department of Transport and Main Roads. The PTSS is required to operate for one hour without any faults occurring. All functionality shall be tested whilst under demonstration. **Witness Point 2**

A Regulatory Compliance Mark (RCM) prescribed by the ACMA shall be required. **Witness Point 3**

The testing documentation for each PTSS used on site shall be provided to the Principal when submitting the Traffic Guidance Scheme (TGS) in accordance with MRTS02 *Provision for Traffic* Clause 5.3.2.

A Site Acceptance Test (SAT) shall also be performed **Witness Point 4** The PTSS is required to operate for 500 hours without any faults occurring whilst being operated by a traffic controller at a work site requiring traffic control and must not be left unattended to be considered valid. After 100 hours, additional PTSSs can be used to contribute towards a higher 600 hour requirement.

Table 12 – PTSS required testing hours

Number of PTSS	Hours per PTSS	Hours Total
1	500	500
2	300	600
3	200	600
4	150	600
5	120	600

Whilst the SAT is being performed a detailed log must be kept and must contain the following information:

- date
- start and end time

- hours used
- company
- location
- name of traffic controller(s) using the PTSS
- number of faults
- description of faults, and
- signature.

13 Warranty provisions

The warranty requirements defined in MRTS201 *General Equipment Requirements* apply to this Technical Specification.

14 Training requirements

The training requirements defined in MRTS201 *General Equipment Requirements* apply to this Technical Specification.

15 Maintenance requirements

The maintenance requirements defined in MRTS201 *General Equipment Requirements* apply to this Technical Specification.

16 Handover requirements

The handover requirements defined in MRTS201 *General Equipment Requirements* apply to this Technical Specification.

Superseded

Superseded