Specification (Measurement)

Transport and Main Roads Specification
MRS263 Standalone Solar (PV) Power Systems

July 2019

Queensland Government

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1 Introduction

This Specification applies to the supply, installation, testing, commissioning and maintenance of Standalone Solar (PV) Power Systems. It covers the Power System types listed in Table 1(a), Battery Power Supply types listed in Table 1(b), Mounting types listed in Table 1(c) and Battery Enclosure types listed in Table 1(d).

Table 1(a) – Power system types

Type
Flag lighting
Road lighting
Pathway lighting
Variable speed limit and lane control signs
Vehicle activated sign
Electronic school zone sign
Imaging equipment
Electronic traffic control sign
Road weather monitoring system
Roadway flood monitoring system
Automatic number plate recognition system
Temporary variable speed limit sign
Temporary/Fixed variable message sign
Type-2 portable traffic signals

Table 1(b) – Battery power supply types

Type
Vehicle activated sign
Electronic school zone sign
Imaging equipment
Road weather monitoring system
Roadway flood monitoring system
Automatic number plate recognition system
Temporary variable speed limit sign
Temporary/fixed variable message sign
Type-2 portable traffic signals

Table 1(c) – Mounting types

Type
Integrated PV/road lighting base plate mounted pole [*height*] mm vertical height [*with* | *without*] single road lighting outreach arm [*length*] mm long
Separate pole [*base plate mount* | *slip base mount*] [*height*] mm vertical height [*with* | *without*] single road lighting outreach arm [*length*] mm long
Separate base plate mount PV array pole [*height*] mm vertical height
Special structure [*height*] mm vertical height
Same pole as sign
Portable structure
Vehicle
Concrete block
Trailer
Fixed structure

Table 1(d) – Battery enclosure types

Type
Pit
Switchboard enclosure
ITS enclosure
Post mounted enclosure
Trailer mounted enclosure
Traffic signal controller enclosure
Portable structure enclosure
Fixed structure enclosure
Existing enclosure

This Specification shall be read in conjunction with MRS01 *Introduction to Specifications*, MRTS263 *Standalone Solar (PV) Power Systems* and other Specifications as appropriate.

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

2 Measurement of works

2.1 Standard work items

In accordance with the provisions of Clause 2.1.3 of MRS01 *Introduction to Specifications*, the Standard Work Items covered by this Specification are listed in Table 2.1.

Table 2.1 – Standard Work Items

Standard Item No.	Description	Unit of Measurement
Standalone Solar (PV) Power Systems		
67801	Conduct a solar survey to confirm the proposed location of the solar panels will be exposed to a sufficient level of solar irradiance	each
67802	Survey of site to identify location of separated PV array structure	each
67803	Design for supply and installation of separated PV array structure	each
67804	Design for supply and installation of footing for the separated PV array structure	each
67805	Design of the standalone solar power system	each
67806	Design of the battery power supply	each
67807	Supply of Standalone Solar (PV) Power System for [*Power system type*] mounted on [*Mounting type*] with [*Lead-acid AGM*	*Lithium iron phosphate*] batteries [*Battery enclosure type*]	each
67808	Installation of Standalone Solar (PV) Power System for [*Power system type*] mounted on [*Mounting type*] with [*Lead-acid AGM*	*Lithium iron phosphate*] batteries in [*Battery enclosure type*]	each
67809	Supply and installation of Standalone Solar (PV) Power System for [*Power system type*] mounted on [*Mounting type*] with [*Lead-acid AGM*	*Lithium iron phosphate*] batteries in [*Battery enclosure type*]	each
67810	Supply of Battery Power Supply in accordance with MRTS201 for [*Battery power supply type*] mounted on [*Mounting type*] with [*Lead-acid AGM*	*Lithium iron phosphate*] batteries in [*Battery enclosure type*]	each
67811	Installation of Battery Power Supply in accordance with MRTS201 for [*Battery power supply type*] mounted on [*Mounting type*] with [*Lead-acid AGM*	*Lithium iron phosphate*	*Lithium-ion*] batteries in [*Battery enclosure type*]	each
67812	Supply and Installation of Battery Power Supply in accordance with MRTS201 for [*Battery power supply type*] mounted on [*Mounting type*] with [*Lead-acid AGM*	*lead-acid Gel*	*Lithium iron phosphate*	*Lithium-ion*] batteries in [*Battery enclosure type*]	each
Auxiliary devices		
67871	Supply of [*Solar Panels*	*Charge controller*	*Batteries*	*Inverter*]	each
67872	Installation of [*Solar Panels*	*Charge controller*	*Batteries*	*Inverter*]	each
67873	Supply and Installation of [*Solar Panels*	*Charge controller*	*Batteries*	*Inverter*]	each
67874	Supply of [*Mains battery charger*	*batteries*	*battery monitoring system*]	each
67875	Installation of [*Mains battery charger*	*batteries*	*battery monitoring system*]	each

Standard Item No.	Description	Unit of Measurement
67876	Supply and Installation of [*Mains battery charger* | *batteries* | *battery monitoring system*]	each
Removal for salvage or disposal		
67891	Removal of [*integral* | *separate*] Solar Power System for [*Power system type*]	each
67892	Removal of Battery Power Supply for [*Battery power supply type*]	each

2.2 Work Operations

Item 67801 Conduct a solar survey to confirm the proposed location of the solar panels will be exposed to a sufficient level of solar irradiance

Work Operations incorporated in the above item include:

a) Work Operations listed in Clause 2.1.5 of MRS01 *Introduction to Specifications*

b) carry out site solar survey

c) ensure the array will not be shaded from 9am to 3pm on any day

d) ensure the array is not shaded in any month of the year during the solar window

e) identify any obstacles that would shade the array between 9am and 3pm

f) make recommendations if the proposed location would have shading.

Item 67802 Survey of site to identify location of separated PV array structure

Work Operations incorporated in the above item include:

a) Work Operations listed in Clause 2.1.5 of MRS01 *Introduction to Specifications*

b) geographical survey works appropriate to the task

c) all work associated with the provision of separated PV array structure including site survey details of the exact location, height and alignment of the array, including pits and conduits

d) survey using a mechanism such as ground penetrating radar to determine location of utilities, and

e) all necessary soil tests.

Item 67803 Design for supply and installation of separated PV array structure

Work Operations incorporated in the above item include:

a) Work Operations listed in Clause 2.1.5 of MRS01 *Introduction to Specifications*

b) design for all civil earth works and structural components

c) all work associated with the preparation, submission and amendment (where necessary) of support structure design documentation and drawings for the separated PV array structure, including all relevant design calculations and certifications

d) design all work associated with the preparation, submission and amendment (where necessary) of footing design documentation for the separated PV array structure

e) design the required electrical civil works, and

f) design the required communications and control links civil works.

Item 67804 Design for supply and installation of footing for the separated PV array structure

Work Operations incorporated in the above item include:

a) Work Operations listed in Clause 2.1.5 of MRS01 *Introduction to Specifications*

b) excavation for footing

c) disposal of excavated material

d) provision of formwork, where necessary

e) supply and installation of anchor cage or rag-bolt assembly, as appropriate

f) supply and installation of conduit to electrical pit, as appropriate

g) supply, placement, installed and tested and finishing of concrete

h) stripping formwork and cleaning up, and

i) disposal of excavated material.

Item 67805 Design of the standalone solar power system

Work Operations incorporated in the above item include:

a) Work Operations listed in Clause 2.1.5 of MRS01 *Introduction to Specifications*

b) design for all solar and electrical works, selection of electrical/electronic and balance of system (BOS) components, full design calculations showing site specific criteria, derating factors, and equipment selected demonstrating that the design achieves the specified requirements

c) design for battery ventilation requirements, and suitability of battery underground installation

d) fabrication drawings, electrical schematics and wiring drawings, and

e) all work associated with the preparation, submission and amendment (where necessary) of solar/electrical design documentation and drawings for the solar power system, including all relevant design calculations and certifications.

Item 67806 Design of the battery power supply

Work Operations incorporated in the above item include:

a) Work Operations listed in Clause 2.1.5 of MRS01 *Introduction to Specifications*

b) design for all electrical works, selection of electrical/electronic and BOS components, full design calculations showing, derating factors, and equipment selected demonstrating that the design achieves the specified requirements

c) design for battery ventilation requirements, and suitability of battery underground installation;

d) fabrication drawings, electrical schematics and wiring drawings, and

e) all work associated with the preparation, submission and amendment (where necessary) of electrical design documentation and drawings for the battery power system, including all relevant design calculations and certifications.

Item 67807 Supply of Standalone Solar (PV) Power System for [*Power system type*] mounted on [*Mounting type*] with [*Lead-acid AGM* | *Lithium iron phosphate*] batteries [*Battery enclosure type*]

Work operations incorporated in the above item include:

a) Work operations listed in Clause 2.1.5 of MRS01 *Introduction to Specifications*

b) fabrication and supply of structure required for the solar power system including, clamping bolts, all fixing bolts, nuts and washers, and the like as appropriate

c) supply of PV modules with mountings and fixings including pole for separated system

d) supply of batteries, charge controller and inverter as appropriate

e) supply of battery enclosure

f) supply of BOS equipment

g) handover of Factory Acceptance Test reports of assembled integral solar power system.

h) completion of the first maintenance performance records as appropriate, and

i) packaging and delivery to site.

Item 67808 Installation of Standalone Solar (PV) Power System for [*Power system type*] mounted on [*Mounting type*] with [*Lead-acid AGM* | *Lithium iron phosphate*] batteries in [*Battery enclosure type*]

Work operations incorporated in the above item include:

a) Work operations listed in Clause 2.1.5 of MRS01 *Introduction to Specifications*

b) assembly and installation of structure required for the solar power system including footing for separated system, as appropriate

c) installation of PV modules with mountings and fixings

d) installation of batteries, charge controller and inverter as appropriate

e) installation of battery enclosure

f) installation of BOS equipment and connection to load

g) completion of Commissioning tests, and

h) handover of all documents and test reports to the Administrator.

Item 67809 Supply and installation of Standalone Solar (PV) Power System for [*Power system type*] mounted on [*Mounting type*] with [*Lead-acid AGM* | *Lithium iron phosphate*] batteries in [*Battery enclosure type*]

Work operations incorporated in the above item include:

a) Work operations listed in Clause 2.1.5 of MRS01 *Introduction to Specifications*

b) fabrication, supply, assembly and installation of structure required for the solar power system including, clamping bolts, all fixing bolts, nuts and washers, and the like and including footing for separated system as appropriate

c) supply and installation of PV modules with mountings and fixings

d) supply and installation of batteries, charge controller and inverter as appropriate

e) supply and installation of battery enclosure

f) supply and installation of BOS equipment and connection to load

g) handover of Factory Acceptance Test reports of assembled integral solar power system.

h) completion of Commissioning tests, and

i) handover of all documents and test reports to the Administrator.

Item 67810 Supply of Battery Power Supply in accordance with MRTS201 for [*Battery power supply type*] mounted on [*Mounting type*] with [*Lead-acid AGM | Lithium iron phosphate*] batteries in [*Battery enclosure type*]

Work operations incorporated in the above item include:

a) Work operations listed in Clause 2.1.5 of MRS01 *Introduction to Specifications*

b) supply of integral battery power supply in accordance with MRTS201 *General Equipment Requirements*

c) handover of Factory Acceptance Test reports of assembled integral battery power system.

d) completion of the first maintenance performance records, and

e) packaging and delivery to site.

Item 67811 Installation of Battery Power Supply in accordance with MRTS201 for [*Battery power supply type*] mounted on [*Mounting type*] with [*Lead-acid AGM | Lithium iron phosphate | Lithium-ion*] batteries in [*Battery enclosure type*]

Work operations incorporated in the above item include:

a) Work operations listed in Clause 2.1.5 of MRS01 *Introduction to Specifications*

b) installation of integral battery power supply in accordance with MRTS201 *General Equipment Requirements*

c) completion of Commissioning tests, and

d) handover of all documents and test reports to the Administrator.

Item 67812 Supply and Installation of Battery Power Supply in accordance with MRTS201 for [*Battery power supply type*] mounted on [*Mounting type*] with [*Lead-acid AGM | lead-acid Gel | Lithium iron phosphate | Lithium-ion*] batteries in [*Battery enclosure type*]

Work operations incorporated in the above item include:

a) Work operations listed in Clause 2.1.5 of MRS01 *Introduction to Specifications*

b) supply and installation of integral battery power supply in accordance with MRTS201 *General Equipment Requirements*

c) completion of Commissioning tests, and

d) handover of all documents and test reports to the Administrator.

Item 67871 Supply of [*Solar Panels* | *Charge controller* | *Batteries* | *Inverter*]

Work Operations incorporated in the above item include:

a) Work Operations listed in Clause 2.1.5 of MRS01 *Introduction to Specifications*

b) supply a Solar Panel

c) supply a charge controller

d) supply batteries and protection devices, and

e) supply an inverter.

Item 67872 Installation of [*Solar Panels* | *Charge controller* | *Batteries* | *Inverter*]

Work Operations incorporated in the above item include:

a) Work Operations listed in Clause 2.1.5 of MRS01 *Introduction to Specifications*

b) installation of a Solar Panel

c) installation of a charge controller

d) installation of batteries and protection devices, and

e) installation of an inverter.

Item 67873 Supply and Installation of [*Solar Panels* | *Charge controller* | *Batteries* | *Inverter*]

Work Operations incorporated in the above item include:

a) Work Operations listed in Clause 2.1.5 of MRS01 *Introduction to Specifications*

b) supply and installation of a Solar Panel

c) supply and installation of a charge controller

d) supply and installation of batteries and protection devices, and

e) supply and installation of an inverter.

Item 67874 Supply of [*Mains battery charger* | *Batteries* | *Battery monitoring system*]

Work Operations incorporated in the above item include:

a) Work Operations listed in Clause 2.1.5 of MRS01 *Introduction to Specifications*

b) supply of a mains battery charger

c) supply of batteries, and

d) supply of battery monitoring system.

Item 67875 Installation of [*Mains battery charger* | *Batteries* | *Battery monitoring system*]

Work Operations incorporated in the above item include:

a) Work Operations listed in Clause 2.1.5 of MRS01 *Introduction to Specifications*

b) installation of a mains battery charger

c) installation of batteries, and

d) installation of battery monitoring system.

Item 67876 Supply and Installation of [*Mains battery charger* | *Batteries* | *Battery monitoring system*]

Work Operations incorporated in the above item include:

a) Work Operations listed in Clause 2.1.5 of MRS01 *Introduction to Specifications*

b) supply and installation of a mains battery charger

c) supply and installation of batteries, and

d) supply and installation of battery monitoring system.

Item 67891 Removal of [*integral* | *separate*] Solar Power System for [*Power system type*]

Work operations incorporated in the above item include:

a) Work operations listed in Clause 2.1.5 of MRS01 *Introduction to Specifications*

b) making PV array safe

c) disconnection of battery supply

d) de-energisation and disconnection of cabling

e) removal of solar power system including associated components as appropriate

f) removal of pole, pole adaptor and associated components as appropriate

g) removal of footing, backfilling of hole, ground compaction, reinstatement of the compacted hole to match undisturbed surrounding

h) for equipment to be salvaged:

   i. dismantling of equipment, pole and components, where appropriate, and

   ii. transporting of all components to designated storage facility or another station for re-use.

i) for equipment to be disposed:

   i. disposal of demolished components.

Item 67892 Removal of Battery Power Supply for [*Battery power supply type*]

Work operations incorporated in the above item include:

a) Work operations listed in Clause 2.1.5 of MRS01 *Introduction to Specifications*

b) disconnection of battery supply

c) de-energisation and disconnection of cabling

d) for equipment to be salvaged:

   i. dismantling of equipment, where appropriate, and

   ii. transporting of all components to designated storage facility or another station for re-use.

e) for equipment to be disposed:

   i. disposal of demolished components.

2.3 Method of measurement of Standalone Solar (PV) Power Systems and Battery Power Supply components

This Specification provides Standard Work Items for:

a) Supply only

b) Installation only, and

c) Supply and Installation

of Standalone Solar (PV) Power Systems and Battery Power Supply.

Any combination of Standard Work Items relating to these methods of measurement may be used in the Schedule of Rates. However, where a Standard Work Item for supply and installation of a particular component or group of components is included in the Schedule of Rates, no supply only nor installation only Standard Work Item shall also apply to that component or group of components, as applicable

2.4 Supply of materials

Any materials to be supplied by the Principal will be as stated in the Principal Supplied Material List, Form C6827. All other material shall be supplied by the Contractor.

The responsibility for transport to the Site of materials supplied by the Principal shall be as stated in the Principal Supplied Material List, Form C6827. Transport to the Site of all other materials shall be the responsibility of the Contractor.