Technical Specification

Transport and Main Roads Specifications
MRTS93 Traffic Signals

March 2024

Copyright

Licence

CC BY licence summary statement

Translating and interpreting assistance

The Queensland Government is committed to providing accessible services to Queenslanders from all cultural and linguistic backgrounds. If you have difficulty understanding this publication and need a translator, please call the Translating and Interpreting Service (TIS National) on 13 14 50 and ask them to telephone the Queensland Department of Transport and Main Roads on 13 74 68.

Disclaimer

While every care has been taken in preparing this publication, the State of Queensland accepts no responsibility for decisions or actions taken as a result of any data, information, statement or advice, expressed or implied, contained within. To the best of our knowledge, the content was correct at the time of publishing.

Feedback

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

Contents

1 Introduction

This Technical Specification applies to the supply and installation of traffic signals hardware, associated control equipment and cabling.

This Technical Specification shall be read in conjunction with MRTS01 *Introduction to Technical Specifications*, MRTS50 *Specific Quality System Requirements,* MRTS201 *General Equipment Requirements* and other Technical Specifications as appropriate.

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

2 Definition of terms

The terms used in this Technical Specification shall be as defined in Clause 2 of MRTS01 *Introduction to Technical Specifications*. Further definitions are referenced in Table 2 and AS/NZS 3000. All referenced documents or legislation shall be the latest published or proclaimed version or revision.

Table 2 – Definition of terms

Term	Definition
Act	*Electrical Safety Act* 2002 and associated regulations and codes of practice.
Administrator	Principal's Representative or Superintendent as stated in Clause 14 of MRTS01 *Introduction to Technical Specifications*.
Design Drawing	These are project specific drawings for a site or location (typically, Issue For Construction drawings).
Electrical engineer	Electrical engineer as defined by Schedule 2 of the Act, who has experience in the scope of this Technical Specification as listed in the Transport and Main Roads Core Competency Skills.
Electrical work	As defined in the Act.
Electricity entity	As defined in the Act.
Licensed electrical contractor	Holder of an Electrical Contractor License under the Act.
Pit	A wiring enclosure used to provide space for placing and joining cables, pulling cables, performing an operation on cables or for the inclusion of other equipment.
RPEQ	Electrical Engineer who is also a Registered Professional Engineer of Queensland as defined by the *Professional Engineers Act* of Queensland.
Standard Drawings	Transport and Main Roads Standard Drawings (refer to Table 3.2).
URD	Underground Residential Development as defined by the electricity entity.
Wiring rules	AS/NZS 3000 and / or AS/ACIF S009 as appropriate to the respective service.

3 Referenced documents

3.1 Standards

Table 3.1 lists documents referenced in this Technical Specification or relevant to the design, construction, maintenance and operation of traffic signals. All Technical Specifications documents referenced in this Technical Specification or relevant to the design, construction, maintenance and operation of traffic signals may be accessed from the department's website.

Table 3.1 – Referenced documents

Reference	Title
AS 2339	*Traffic signal post, mast arms and attachments*
AS/NZS 3000	*Electrical Installations (known as the Australian / New Zealand Wiring Rules)*
DDPSM Vol 2	*Drafting and Design Presentation Standards Manual*, *Volume 2*
MRTS01	*Introduction to Technical Specifications*
MRTS04	*General Earthworks*
MRTS21	*Bituminous Emulsion*
MRTS50	*Specific Quality System Requirements*
MRTS78	*Fabrication of Structural Steelwork*
MRTS91	*Conduits and Pits*
MRTS94	*Road Lighting*
MRTS97	*Mounting Structures for Roadside Equipment*
MRTS200	*General Requirements for (ITS) Infrastructure*
MRTS201	*General Equipment Requirements*
MRTS204	*Vehicle Detectors*
MRTS210	*Provision of Mains Power*
MRTS211	*Pedestrian Push Buttons and Audio Tactile Drivers*
MRTS228	*Electrical Switchboards*
MRTS252	*Next Generation Traffic Signal Controllers*
MRTS253	*Traffic Signal Lanterns*
MRTS255	*Traffic Signal Controllers*
MRTS256	*Power Cables*
MRTS257	*Feeder Cable and Loop Cable for Vehicle Detector*
Queensland MUTCD	*Queensland Manual of Uniform Traffic Control Devices*
Queensland MUTCD Part 3	*Queensland Manual of Uniform Traffic Control Devices – Part 3: Traffic Control for Work on Roads*
QGTM Part 9	*Queensland Guide to Traffic Management Part 9 – Smart Pedestrian Crossing Guideline*
RPDM	*Road Planning and Design Manual*
TRUM Volume 4 Part 3	*Traffic and Road Use Management Manual*, *Volume 4 Part 3 Electrical Design for Roadside Devices*

Reference	Title
TRUM volume 4 Part 5	*Traffic and Road Use Management Manual, Volume 4 Part 5 – Configuration and Placement of Traffic Sensors*
TRUM volume 4 Part 8	*Traffic and Road Use Management Manual*, *Volume 4 Part 8 – Electrical Verification Requirements for New or Altered Roadside Installations*

3.2 Standard Drawings

All Standard Drawings referenced in this document or relevant to the design, construction, maintenance and operation of traffic signals may be accessed from the department's website.

Table 3.2 – Referenced Standard Drawings

Standard Drawing Number	Title
1323	*Road Lighting – Luminaire Terminal Panel*
1377	*Traffic Signals/Road Lighting – Joint Use Traffic Signal and Road Lighting Pole*
1396	*Traffic Signals/Road Lighting – Joint Use Traffic Signal and Road Lighting Pole and Footing Installation Details*
1399	*Road Lighting – Base Plate Mounted Pole Wiring Details*
1403	*Traffic Signals - Mast Arm and Footing Installation Details*
1407	*Traffic Signals – Traffic Signal Terminal Panel for Joint Use Poles*
1408	*Traffic Signals – Traffic Signal Terminal Panel for Joint Use Poles Wiring Details*
1411	*Road Lighting – Mast Arm Road Lighting Junction Box (Type B)*
1412	*Road Lighting – Mast Arm Road Lighting Junction Box (Type B) Wiring Details*
1413	*Traffic Signals – Mast Arm Traffic Signal Junction Box (Type A)*
1414	*Traffic Signals – Mast Arm Traffic Signal Junction Box (Type A) Wiring Details*
1420	*Traffic Signals – General Arrangements*
1423	*Traffic Signals - Traffic Signal Controller Base Installation Details*
1424	*Traffic Signals – Detector Loops Installation Details*
1425	*Traffic Signals – Detector Loops Placement Details*
1427	*Traffic Signals/Road Lighting – Mast Arm (U Series) Installation Details*
1428	*Traffic Signals – Traffic Signal Post Base Mounted*
1437	*Traffic Signals – Hinged Base Plate for Traffic Signal Post Fabrication Details*
1439	*Traffic Signals – Traffic Signal Lantern Designations, Functions and Aiming*
1624	*Road Lighting – Junction Box Single Phase Wiring Details*
1625	*Road Lighting – Junction Box Three Phase Wiring Details*
1677	*Traffic Signals/Road Lighting – Joint Use Pole/Combination Mast Arm Electrical Wiring Schematic Rate-3*
1701	*Traffic Signals – Detector Loops Counting/Right Turn Loops and Diode Connection Details*

Standard Drawing Number	Title
1702	*ITS – Detector Loops Motorway Management Placement Details*
1782	*ITS IPRT Network – Typical Traffic Controller with Telstra Modem and Associated Next G Antenna*
1783	*ITS IPRT Network – Typical Traffic Controller with Tophat Telstra Modem and Associated Next G Antenna*

4 Quality system requirements

4.1 Hold Points, Witness Points and Milestones

General requirements for Hold Points, Witness Points and Milestones are specified in Clause 5.2 of MRTS01 *Introduction to Technical Specifications*.

The Hold Points, Witness Points and Milestones applicable to this Technical Specification are summarised in Table 4.1.

Table 4.1 – Hold Points, Witness Points and Milestones

Clause	Hold Point	Witness Point	Milestone
7.1	1. Approval of Design for each lot of traffic signal work	1. Certified by a RPEQ	Submission of designs (28 days)
7.2	2. Changes to approved design		
7.3	3. Configuration file verification		
11.3		2. Cutting slots for detector loops	
12.2		3. Modification to existing controller	
13.2		4. Cable laying	
14		5. Mains power connection	
15.1.1	4. Salvage of items of traffic signal equipment		Submission of schedule of items to be salvaged (seven days)
15.1.3	5. Approval prior to removal of items to be salvaged which cause damage		
16.1	6. Submission of compliance testing procedure (28 days) 7. Commencement of compliance testing		
16.2	8. Compliance testing		

4.2 Construction procedures

Construction procedures which are required to be submitted in accordance with Clause 1 of MRTS50 *Specific Quality System Requirements* are listed in Table 4.2.

Table 4.2 – Construction procedures

Clause	Procedure
12.2	Modification of controller
13.2	Laying of cables
15.1	Removal, transport and storage of existing equipment to be salvaged
16	Compliance testing

5 Compliance with electrical legislation

The work covered by this Technical Specification shall comply with the requirements of the Act, subordinate legislation and AS/NZS 3000.

A licensed electrical contractor shall be engaged to perform the duties and functions of 'electrical work' as defined in the Act.

An electrical engineer shall be engaged to perform the duties of design work within the scope of this Technical Specification and the requirements of TRUM Volume 4 Part 3 *Electrical Design for Roadside Devices*.

6 Materials and equipment

6.1 General

All materials shall comply with the requirements of this Technical Specification and the details shown on the Standard Drawings nominated herein and / or the drawings on the Transport and Main Roads website.

For traffic signal installations only, approved products shall be used. For structural items, refer to MRTS78 *Fabrication of Structural Steelwork* and the relevant Standard Drawings.

For traffic signal equipment, refer to the ITS approved products list.

6.2 Traffic signal equipment

Equipment shall be supplied and manufactured in accordance with the requirements of:

- MRTS78 *Fabrication of Structural Steelwork*
- MRTS97 *Mounting Structures for Roadside Equipment*
- MRTS211 *Pedestrian Push Buttons and Audio Tactile Drivers*
- MRTS252 *Next Generation Traffic Signal Controllers*
- MRTS253 *Traffic Signal Lanterns*
- MRTS255 *Traffic Signal Controllers*
- MRTS256 *Power Cables*, and
- MRTS257 *Feeder Cable and Loop Cable for Vehicle Detector*.

6.3 Road lighting equipment

Road lighting components not specifically described in this Technical Specification shall comply with the requirements of MRTS94 *Road Lighting*.

6.4 Junction boxes

Column-mounted traffic signal junction boxes shall comply with the details shown on Standard Drawing 1413. Column-mounted road lighting junction boxes shall comply with details shown on Standard Drawing 1411.

Road lighting junction boxes installed in pits for joint use poles or combination mast arms shall comply with the details shown on Standard Drawing 1624 (for single phase supply) and 1625 (for three-phase supply).

6.5 Terminal panels

Terminal panels for installation in joint use traffic signal and road lighting poles shall comply with the details shown on the following Standard Drawings:

a) Traffic signal terminal panels – Standard Drawing 1407, and

b) Road lighting terminal panels – Standard Drawing 1323.

6.6 Conduits

Corrugated conduit shall not be used for trenched or traffic signal installations. Heavy duty corrugated or Core-flow™ conduit types are also excluded from traffic signal installations.

6.7 Cement mortar and/or grout

Cement mortar and/or grout shall be used in the installation of Traffic Signal Posts, Joint Use Poles and Mast Arms as shown in Standard Drawings 1421, 1396, and 1403 respectively.

7 Design and Configuration

This Technical Specification sets out the processes for provision of IFC design and Principal-supplied configuration to be undertaken by the contractor. It does not cover design and configuration requirements.

The issue-for-construction (IFC) design will include plans and specifications for the traffic signal installation focusing on their functionality and how they integrate with the traffic system. The IFC Design is crucial as it should inform the delivery of Configuration file for the installation.

The delivery of the configuration file for Traffic Signal installations shall be Principal supplied.

7.1 Submission of design

Where design of the traffic signal installation is undertaken by the Contractor, the following requirements shall apply.

Where traffic signals are required for temporary use during construction, the Contractor shall design, supply, install, test, commission and maintain the temporary traffic signals in accordance with this Technical Specification, MRTS200 *General Requirements for Intelligent Transport Systems* and Queensland MUTCD Part 3 *Traffic control for works on roads*.

Not less than 28 days prior to the commencement of the development of the configuration files, the Contractor shall submit to the Administrator, a traffic signal design and design report which complies with the requirements of the RPDM, this Technical Specification and relevant Standard Drawings. **Milestone**

The design shall be submitted in accordance with the provisions of the Contract governing design by the Contractor. As a guidance note, if the Contractor chooses to divide the work into lots as per MRTS50 *Specific Quality System Requirements*, then it is recommended that all of the traffic signal equipment at each intersection be considered as one lot. Generally, the MRTS91 *Conduits and Pits*, MRTS94 *Road Lighting* or MRTS228 *Electrical Switchboards* and MRTS256 *Power Cables* guidance would say each lot should include all equipment connected to each electrical switch board.

The design shall be certified by a person experienced in traffic signal design and holding a current registration as a Registered Professional Engineer of Queensland (RPEQ). **Witness Point 1**

Construction under this Technical Specification shall not commence until approval is granted by the department or as otherwise provided for by the Contract. **Hold Point 1**

7.2 Design changes during construction

Any change to the design of any component proposed during construction including any temporary staging works shall be subject to the provisions of Clause 7.1 and referred to the engineer responsible for the original design. Only after all the requirements of this Technical Specification have been satisfied, shall such changes be incorporated in the Works. Any temporary staging works impacted by the change to the design must also be approved **Hold Point 2**

7.3 Supply and installation of configuration files

The contractor shall liaise with the Principal to ensure timely delivery of the configuration files prior to installation.

A minimum of 10 business days before the planned installation of traffic signal equipment, the Contractor shall provide the Administrator with a certificate confirming the configuration files are in accordance with design. This certificate must provide evidence of quality assessment through an independent evaluation, to ensure accuracy and compliance with design. **Hold Point 3**

This clause has been moved here from Clause 12 and converted to a Hold Point. It was revised to replace the “personality EEPROM” with the generic term “Configuration files”. Legacy controllers will continue to provide the configuration files in the form of memory device or EEPROM.

7.4 Electricity entity

As part of the design requirement, the provision of new traffic signal installations and the removal or relocation of existing traffic signal equipment shall require advice be provided to the electricity entity. Such advice shall include at least a record of the location (e.g. suburb), wattage and pole number of all traffic signal poles. A copy of such advice shall be included in the quality records.

8 Installation of posts, poles and mast arms

8.1 General

Installation of traffic signal posts, traffic signal mast arms, joint-use traffic signals and road lighting poles shall comply with the requirements of the details shown in the drawings and/or the relevant Standard Drawings.

All equipment used in the installation must be approved by Transport and Main Roads, unless advised otherwise. Refer to MRTS78 *Fabrication of Structural Steelwork* and the relevant Standard Drawings for approved products and suppliers.

Care shall be taken to ensure that any openings for cables, junction boxes, push buttons or outreach arms are correctly aligned when assembling and installing components.

Any openings not used, shall be sealed to prevent ingress of water or vermin using a plug that does not compromise the structural integrity of the pole.

8.2 Traffic signal posts

The general installation requirements for traffic signal posts are shown on Standard Drawing 1428.

The location and length of traffic signal posts shall be as shown in the drawings.

Posts shall be installed on the hold down bolts at the appropriate level. Before tightening the nuts, posts shall be aligned vertically by adjustment of the levelling nuts.

Where shown in the drawings, a hinged base plate complying with the details shown on Standard Drawing 1437 shall be installed.

8.3 Traffic signal mast arms

The general installation requirements for traffic signal mast arms are shown on Standard Drawing 1427.

A traffic signal junction box shall be installed on the pole in accordance with Standard Drawing 1414.

The location, outreach length and orientation of traffic signal mast arms shall be as shown in the drawings.

The mast arm outreach may be pre-assembled to the mast arm column or may be installed after erection of the mast arm column. The joint between the mast arm column and the outreach shall be sealed with an appropriate silicone sealant, which shall not damage the galvanised coating.

Mast arm columns shall be installed on the hold down bolts at the appropriate level with the column set vertical.

The outreach lantern cable shall be installed in the mast arm assembly and terminated at each end.

Where the mast arm has a road lighting luminaire spigot which is not to be used immediately, a spigot cap shall be installed on the spigot and sealed with an appropriate silicone sealant which shall not damage the galvanised coating.

After all traffic signal lanterns have been fitted to the mast arm column and outreach, the rake of the column shall be adjusted to provide the most pleasing aesthetic appearance from a distance in any direction without affecting the visibility of the traffic signal lanterns. This may need to be a compromise due to deflection in the column and outreach.

When the mast arm is in the correct location the space between the underside of the base plate and the top of the footing shall be packed with dry cement mortar. The edges of the mortar shall be finished in accordance with the details shown on Standard Drawing 1403.

8.4 Traffic signal combination mast arms with road lighting extensions

Where shown in the drawings, a road lighting installation shall be included with the traffic signal mast arm. The electrical installation shall comply with Standard Drawing 1412 for the road lighting connections and Standard Drawing 1414 for the traffic signal connections. The electrical wiring schematic for traffic signal combination mast arms with road lighting extensions is shown in Standard Drawing 1677.

When road lighting is required, the traffic signal mast arm column shall include a road lighting spigot. A road lighting transition piece shall be installed on the spigot and a road lighting junction box shall be fixed to the column at the location shown on Standard Drawing 1427.

The road lighting luminaire cable shall be installed from the pit to the open end of the luminaire transition piece.

The remainder of the road lighting components shall be supplied and installed in accordance with the requirements of MRTS94 *Road Lighting*.

8.5 Joint use traffic signal and road lighting poles

The general installation requirements for joint use traffic signal and road lighting poles are shown on Standard Drawing 1377. The electrical wiring schematic for joint use traffic signal and road lighting poles is shown in Standard Drawing 1677.

The location of joint use traffic signal and road lighting poles shall be as shown in the drawings.

Poles shall be installed on the holding down bolts at the appropriate level. Before tightening the nuts, poles shall be set vertical by adjustment of the levelling nuts.

When the pole is in the correct location the space between the underside of the base plate and the top of the footing shall be packed with mortar and finished in accordance with the details shown on Standard Drawing 1396.

The traffic signal and road lighting terminal panels shall be installed on the pole in accordance with Standard Drawing 1399 for road lighting connections and Standard Drawing 1408 for the traffic signal connections.

The traffic signal and road lighting terminal panels shall be installed in the pole at the appropriate locations.

The road lighting supply cable shall be installed from the road lighting pit to the road lighting terminal panel and the luminaire cable shall be installed from the terminal panel to the upper end of the pole. An appropriate junction box shall be installed in the road lighting pit.

The remainder of the road lighting components shall be supplied and installed in accordance with the requirements of MRTS94 *Road Lighting*.

9 Installation of lanterns

9.1 General

Traffic signal vehicle lanterns and pedestrian lanterns shall be installed with relevant accessories as shown in the drawings or as otherwise specified in this Technical Specification.

9.2 Mounting height

Mounting heights for traffic signal vehicle lanterns and pedestrian lanterns shall be as shown in the drawings. Minimum clearance to outreach mounted vehicle lanterns as shown on Standard Drawing 1427 shall be maintained.

9.3 Lantern mounting straps

Lantern mounting straps shall be supplied and installed in accordance with the requirements of AS 2339, and MRTS253 *Traffic Signal Lanterns*.

Where standard straps provided with lanterns are not of a suitable length, they shall be replaced with straps of the required length and under no circumstances shall straps be bolted together to extend their length.

9.4 Lantern cables

Lantern cables shall be installed through appropriate access holes in the support structure and shall be terminated at the appropriate traffic signal terminal panel in accordance with the wiring details shown in the drawings.

9.5 Target boards

Target boards shall be attached to traffic signal vehicle lanterns using the attaching devices supplied, as per AS 2339 and in accordance with Technical Specification requirements.

9.6 Aiming of lanterns

All lanterns shall be appropriately aimed relative to their function and approach speed as per Standard Drawing 1439.

10 Installation of pedestrian detection facilities

10.1 General

Pedestrian detection facilities include:

- push buttons and associated accessories, such as audio tactile drive units and demand indicators, and
- pedestrian radar detectors including carriageway and footpath detectors.

10.2 Pedestrian push buttons

Pedestrian push buttons shall be installed with relevant accessories as shown in the drawings or as otherwise specified in this Technical Specification.

10.2.1 Mounting height

Mounting heights for pedestrian push button assemblies shall be as shown in the drawings Standard Drawing 1428.

10.2.2 Cables

Cables from pedestrian push buttons shall be installed through appropriate access holes in the support structure and shall be terminated at the appropriate traffic signal terminal panel in accordance with the wiring details shown in the drawings.

10.2.3 Orientation

Pedestrian push buttons shall be oriented so that the face of the buttons is parallel to the applicable crosswalk with the face of the buttons on the side on which pedestrians normally walk.

10.2.4 Audio-tactile drive units

Where required by the details shown in the drawings, audio-tactile driver units shall be installed in accordance with MRTS211, in the appropriate location on the face of the support post, column or pole.

10.3 Pedestrian Radar detectors

Pedestrian radar detectors used at intersections shall be installed in accordance with QGTM Part 9-Smart Pedestrian Crossing Guideline.

11 Installation of vehicle detector loops

11.1 General

Traffic signal vehicle detectors consist of vehicle detector loops, radars and other technologies approved by the Principal.

11.1.1 General

Vehicle detector loops shall be installed in the locations shown in the drawings with the assistance, where necessary, of Standard Drawing 1425.

11.1.2 Loop configuration

Loop configurations shall be as shown in the drawings.

11.1.3 Installation of loop

Vehicle detector loops must be installed as per the department's Standard Drawings 1424, 1425, 1701 and 1702, TRUM Volume 4 Part 5 *Configuration and Placement of Traffic Sensors* and MRTS21 *Bituminous Emulsion*.

Any sharp edges in the slot which might damage the detector loop cable during installation shall be smoothed off. The slot shall be cleaned out using dry compressed air. **Witness Point 2**

The detector loop cable shall be installed in the slot in a single continuous length and wound with the number of loops stated in the drawings. Both ends of the cable shall terminate in the jointing pit.

11.1.4 Conduit

A 25 mm nominal diameter conduit shall be installed from the edge of the pavement to the jointing pit in accordance with the requirements of MRTS91 *Conduits and Pits*.

11.1.5 Pits

Unless otherwise shown in the drawings, vehicle detector loop pits shall be installed in accordance with Standard Drawing 1424. Pits shall conform to the requirements of MRTS91 *Conduits and Pits*.

11.1.6 Jointing of cable

The ends of the detector loop cable shall be connected to the detector feed cable in the jointing pit using appropriate epoxy jointing kits, in accordance with Standard Drawing 1424.

11.2 Radar vehicle detector

Where radars are used for vehicle detection at the intersection, they shall be installed in accordance with the requirements of MRTS204 *Vehicle Detectors*.

12 Installation of traffic signal controller

12.1 New controller

Traffic signal controllers shall be installed in the locations shown in the drawings.

The controller shall be positioned on the concrete base and the nuts on the holding down bolts tightened securely in accordance with Standard Drawing 1423.

Where the controller is installed adjacent to the kerb, it shall be oriented such that the door opens on the opposite side of the controller to the carriageway.

Where the controller is equipped with a dimming feature, the operation of the dimming function shall comply with the specific requirements set by the Principal for the site. This includes, but is not limited to, the range of dimming levels, the transition between the levels, the response time of the dimming action, and any site-specific operational criteria.

Where wireless communication equipment is installed in the controller, the modem and associated antenna shall be installed in accordance with Standard Drawing 1782 and 1783. Any holes made, by drilling or otherwise, on the controller enclosure for installation of the antenna, shall be sealed such that the IP rating of the enclosure is not compromised.

An effective earthing electrode shall be installed at the controller in an adjacent pit and shall be connected to the installation earthing terminal.

12.2 Modification to existing controller

Existing traffic signal controllers shall be modified in accordance with the requirements stated in Clause 2 of Annexure MRTS93.1. Such modification may include:

a) the supply and installation of additional components

b) the removal of existing components,

c) Enabling/Disabling dimming, and

d) Provision of revised configuration files as per Clause 7.3.

All modifications to existing traffic signal controllers shall be completed prior to commencement of testing of the installation. **Witness Point 3**

13 Installation of cables

13.1 Internal cables

Cables from a traffic signal terminal assembly to pedestrian lanterns and pedestrian push buttons shall be installed in accordance with the requirements of AS/NZS 3000.

Internal cables for road lighting installations shall be carried out in accordance with the requirements of MRTS94 *Road Lighting*.

13.2 External cables

Cables between a traffic signal controller and:

a) the terminal assembly of traffic signal posts, mast arms and joint use poles, and

b) vehicle detector loops

shall be installed in accordance with the requirements of AS/NZS 3000 and MRTS228 *Electrical Switchboards* and MRTS256 *Power Cables* without intermediate joints. **Witness Point 4**

13.3 Terminations

Terminal connections of traffic signal cables shall be carried out as shown in the relevant standard drawings.

All unused cores in cables shall be terminated at spare terminals at traffic signal posts, mast arms and joint use poles. Unused cores shall be terminated on an earth bar at the traffic signal controller. This earth bar shall be bonded to the main earth bar.

14 Mains connection

Where shown in the design drawings, a mains connection cable shall be installed to an appropriate pole-mounted mains connection box or pillar-mounted switchboard in accordance with the requirements of MRTS228 *Electrical Switchboards* and MRTS256 *Power Cables*. **Witness Point 5** Where specified in the drawings, mains power shall be provided to the site in accordance with MRTS210 *Provision of Mains Power*.

15 Removal of existing equipment

15.1 Items to be salvaged

15.1.1 List of existing items to be salvaged

Any items of existing equipment to be dismantled and salvaged are listed in Clause 1.1 of Annexure MRTS93.1.

Not less than seven days prior to commencement of dismantling and removal of any existing traffic signal equipment, the Contractor shall submit a schedule of items of existing traffic signal equipment to be dismantled for re-erection in accordance with the drawings. **Milestone**

Dismantling and removal shall not commence until expiration of the seven day period. **Hold Point 4**

15.1.2 Location of storage site

Salvaged items shall be transported to the storage site nominated in Clause 1.2 of Annexure MRTS93.1.

15.1.3 Dismantling and storage

Existing traffic signal equipment to be salvaged shall be dismantled and removed with minimum damage to the items.

Where possible, fittings shall be undone, components disassembled and supports removed without any damage and/or cutting of the components. Where this is not possible, Administrator's approval shall be obtained for any procedure which may cause damage. **Hold Point 5**

Salvaged materials shall be carefully transported to the storage site nominated in Clause 15.1.2.

Salvaged materials shall be neatly stacked at the storage site on appropriate timber packers.

15.2 Items to be demolished

15.2.1 List of existing items to be demolished

The items of existing equipment to be demolished and disposed of are listed in Clause 3 of Annexure MRTS93.1.

Additionally, any footings and bases associated with equipment to be salvaged as defined in Clause 15.1.1 shall be demolished and disposed of.

15.2.2 Demolishing and disposing of materials

Nominated existing traffic signal equipment shall be demolished and removed in a manner which avoids damage to any adjacent items.

All existing footings shall be removed. Resulting excavations shall be backfilled and finished to reinstate the area to a safe and free draining state. Backfilling shall be carried out in accordance with the requirements of MRTS04 *General Earthworks*. The surface shall be reinstated with material matching the surrounding area.

Demolished equipment and debris shall be disposed of in accordance with the requirements of Clause 11 of MRTS01 *Introduction to Technical Specifications*.

16 Compliance testing

16.1 Testing Plan

Not less than 28 days prior to commencement of testing of traffic signal equipment the Contractor shall submit compliance testing plan and associated procedures to the Administrator for approval **Hold Point 6**

The compliance testing plan shall detail all the relevant forms to be completed as part of the testing and handover process. This shall include the relevant documentation from Clause 17 below and any others supplementary documentation required.

Prior to testing, the Administrator may audit the site and any remedial measures that are identified must be rectified by the Contractor.

Compliance testing shall not commence until expiration of the 28 day period. **Hold Point 7**

16.2 Testing requirements

The Contractor is responsible for carrying out appropriate testing to ensure that materials and construction standards comply with this Technical Specification and the requirements of the Act. Electrical tests shall include all tests detailed in TRUM Volume 4 Part 8 as a minimum.

In addition, before commissioning, the following compliance tests shall be carried out:

a) isolation and resistance test, testing of lanterns including any set alarms, flash test, loop continuity and numbering test, push button conductivity and numbering and controller connections to mains power

b) phase and timing testing of the installation, and

c) lamp profiles / load including error levels are as defined in configuration files.

Compliance testing shall be carried out in the presence of the Administrator. **Hold Point 8**

17 Documentation

The documentation requirements defined in MRTS201 *General Equipment Requirements* apply to this Technical Specification. Additionally, the documents listed in Table 17 shall be included in the quality records. The contractor must check with the Administrator whether documents additional to those listed in Table 17 are required and/or which documents are applicable.

Table 17 – List of Documentation

Item #	Category	Document	Reference	Anticipated response or observation	PASS(P), FAIL (F) or N/A
1	**Design (IFC)**	Issue for Construction (IFC) Designs, including any changes - RPEQ certified	Clauses 7.1 and 7.2 of MRTS93	A traffic signal design compliant with RPDM, MRTS93 and relevant Standard Drawings. **[refer Milestone]** Design is certified by RPEQ. **[refer to Witness Point 1]** Any changes to the IFC are referred to the engineer responsible for the original design to ensure the changes satisfy the requirements of this Technical Specification and can be incorporated in the Works. **[refer to Hold Point 2]**	
2	**Controller Forms provided by the Principal**	Pre installation and post-installations forms (refer to list on the right)	Contact NGTSC@tmr.qld.gov.au to obtain the relevant forms and Guidelines on how to complete for the project	Complete the following forms: • Controller Pre-Deployment Check lists 1,2 & 3 • Pre Install Shift Activities • Controller IP settings • Controller Deployment Checklist • Controller Lamp Monitoring Set-up Checklist • Controller ITC-P3 Intersection Configuration • Controller Firmware Upgrade Procedure • Controller Replacement Procedure (knockdown).	
3	**Form M994**	Installation and/or removal of regulatory Traffic Signs / Devices	Contact the Principal to obtain the relevant forms.	A completed form M994 each time the Contractor makes changes to regulatory signs/devices including traffic signals, pedestrian crossings etc.	
4	**Compliance Testing Plan**	Compliance Testing Procedure by the Contractor	Clause 16.1 of MRTS93	Submission of compliance testing procedure, to the Administrator for approval, listing all the relevant forms to be completed as part of the testing and handover process (28 days prior to testing). **[refer to Hold Point 6]**	
5	**Record of Physical Inspection and tests**	Physical Inspections Checklist	Appendix A	Completion of all applicable items in Physical inspection form (see Appendix A) for all new components of the traffic signal installation. Check applicability with Principal.	
6	**Record of Operations tests**	Operations Checklist	Appendix B	Completion of all applicable items Operational test form (see Appendix B) for all new components of the traffic signal installation. Check applicability with Principal.	
7	**Record of Loop installation / operation**	Form M4300	Appendix C of MRTS93 or Appendix D of MRTS204	Confirm completion of the relevant Form M4300 for all new loops at the installation.	
8	**Certificate of Test (Electrical)**	TRUM Volume 4 Part 8	TRUM Volume 4 Part 8	Confirm the contractor has provided a certificate of test in accordance with TRUM Volume 4 Part 8 and signed by a licenced electrician.	
9	**Accurate As Constructed Drawings**	Accurate up to date As Constructed Drawings	MRTS50 and DDPSM and Design manuals provided by the Principal	Confirm the contractor has provided a **complete and accurate** As Constructed drawings signed by appropriately qualified RPEQ. Ensure there is a copy of the connection Sheet and As Constructed drawings in the controller door pocket.	
10	**Asset Data**	Asset data spreadsheet for entry into ROAR	Contact the Principal to obtain the relevant forms and guidelines	Completion of all fields in the form in accordance with instructions provided by the Principal.	

18 Supplementary requirements

The requirements of MRTS93 *Traffic Signals* are varied by the supplementary requirements given in Clause 4 of Annexure MRTS93.1.

Appendix A – Physical Inspection of Traffic Signal Installation

Business Trading Name	ABN	Project Location
Project/Works Order #	**Traffic Signal Site ID (M number)**	**Inspector Name**

Station number	Structure type: Post Mast Arm Combination Mast Arm Joint Use pole Camera pole	Controller/Pole/Post installation		Wirings and terminations at controller, poles/posts are as per project drawings and referenced SDs	Lanterns mounted clear of traffic and installed as per IFC and Standard Drawings							Push buttons installation			Audio Tactile device has acceptable sound level (Acceptable sound level to be determined)	Push button indicator is working as intended in the design	Stickers and Labelling Installed as per IFC, and SD1673	Street Lights installed as per IFC Plan (for Joint Use poles and Combination Mast arms)	All civil works around the installation (Concrete paths, PED paths, Pits, Line Marks, signage, Ramps, Guard-rail, fences etc) are as per the IFC
		Installation as shown in IFC	Grout as per referenced SDs and MRTS93		General Purpose	Extended Range Lanterns	Symbolic displays	Pedestrian Lanterns installed as per IFC	when viewing this lantern, all unrelated lanterns are not viewable	All lanterns Aligned as per SD1439	Visors and louvres effectively reduce sun phantom	as per IFC	height as per SD1428	alignment as per SD1428					
#		yes(✔), No (x) or N/A	yes(✔), No (x) or N/A	yes(✔), No (x) or N/A	yes(✔), No (x) or N/A							yes(✔), No (x) or N/A			yes(✔), No (x) or N/A	yes(✔), No (x) or N/A	yes(✔), No (x) or N/A	yes(✔), No (x) or N/A	yes(✔), No (x) or N/A
CTRLR	Controller				N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A		N/A	
1																			
2																			
3																			
4																			
5																			
6																			
7																			
8																			
9																			
10																			
11																			
12																			
13																			
14																			
15																			
16																			
17																			
18																			

I certify that the information provided in this form accurately reflects my inspection of the installation. All assessments have been made based on the specified standards of installation. Where I have marked 'Yes', it denotes compliance; 'No' indicates non-compliance; and 'N/A' signifies that the specific standard or criterion was not applicable to the inspected installation.

SIGNATURE: _____ **DATE:** _____

Version 1.0

Appendix B – Traffic Signal Site Operations Check (Pre-Commissioning)

Traffic signal site operation check (pre commissioning)

CONTROLLER & DRAWING DETAILS

Controller Type	Controller Operating system	Serial number
Model number	**Product number/Revision**	**Site ID - M number**
IFC Drawing number /Revision	**As CON completed (yes/No) - Date**	**Controller Facility Switch operates as intended (Yes/No)**
Mains Supply available (Yes/No)	**Telecommunications available (Yes/No)**	**All IFC internal hardware installed (Yes/No/NA)**

CONFIGURATION FILE/PERSONALITY DETAILS

Created by (Name/Org)	Created date	Reviewed by (Name/Org)
Review date	**Tested prior to install (Yes/No)**	**Tested by (Name/Org)**
Test date	**Configuration/Personality checksum**	

CONNECTION TO STREAMS

Controller communicates with STREAMS (Yes/No)	Verified by (Name/Org)	Verification date

START-UP SEQUENCE

Flashing yellow mode operates correctly (yes/no)	Start-up sequence operates correctly (yes/no)	Site Verification date

FUNCTIONAL LAMP TEST (FLASH TEST)

Lamp ID-STN ID	Signal group ID	Phase/Stage ID	Based on momentary energisation of each lamp circuit, I confirm that the intersection has been wired correctly. (Yes/No/NA)	Based on cycling the controller through all of its phases/stages signal groups operate as intended. (Yes/No/NA)

DETECTORS AND PUSH BUTTON OPERATIONS

Detector ID	Detector function description (e.g advance loop, stop-line loop, radar, pedestrian PB, Bus detection, light rail detection, RED light camera, tram detection etc)	Energise the controller (with lamp circuits off) and confirm that it responds to each detector as intended

I certify that the information provided in this form accurately reflects my inspection of the installation. All assessments have been made based on the specified standards of installation. Where I have marked 'Yes', it denotes compliance; 'No' indicates non-compliance; and 'N/A' signifies that the specific standard or criterion was not applicable to the inspected installation.

SIGNATURE: _____ **DATE:** _____

Version 1.0

Appendix C – Traffic Signal Loop setting and Measurements record for ITC3 Controllers

Traffic Signals Loop Settings and Measurements Record - ITC3

Location	Controller manufacturer	Date of loop installation
Site identification number/ M number	**Controller model**	**Date data collected**

Loop #	Loop		Loop and feeder cable			Detector data			
	Resistance (Ω)	Inductance (µH)	Insulation Resistance (MΩ)	Resistance (Ω)	Inductance (µH)	Detector Type/Id F10DN2	Card & channel numbers	Detection level (Difference level) F10DN5	Sensitivity Mode F10DN3
	1	2	3	4	5	6	7	8	9
1									
2									
3									
4									
5									
6									
7									
8									
9									
10									
11									
12									
13									
14									
15									
16									

Version 1.0