

Main Roads Technical Standard

MRTS93

Traffic Signals

June 09

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Traffic Signals

1 INTRODUCTION

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

This Technical Standard shall be read in conjunction with MRTS01 *Introduction to Technical Standards*, MRTS50 *Specific Quality System Requirements* and other Technical Standards as appropriate.

This Technical Standard forms part of the Main Roads Specifications and Technical Standards Manual.

2 DEFINITION OF TERMS

The terms used in this Technical Standard shall be as defined in Clause 2 of MRTS01 *Introduction to Technical Standards*. 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	<i>Electrical Safety Act 2002</i> and associated Regulations and Codes of Practice.
Administrator	Principal's Representative or Superintendent as stated in Clause 14 of MRTS01.
Electrical Engineer	Electrical Engineer as defined by Schedule 2 of the Act, who has experience in the scope of this standard, as listed in the Transport and Main Roads Core-Competency, Skills.
Electrical Works	As defined in the Act
Electricity Entity	As defined in the Act.
Licensed Electrician	Holder of an Electrical Work License as defined under 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
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 Standard or relevant to the design, construction, maintenance and operation of Traffic Signals.

Table 3.1 – Referenced Documents

Reference	Title
AS 2144	Traffic signal lanterns
AS 2276.1	Cables for traffic signal installations – Multicore power cables
AS 2276.3	Cables for traffic signal installations – Loop cables for vehicle detectors
AS 2339	Traffic signal posts and attachments
AS 2353	Pedestrian push-button assemblies
AS 2578	Traffic Signal Controllers
AS 2379	Traffic signal mast arms
AS/NZS 3000	Electrical Installations (known as the Australian/New Zealand Wiring Rules)
AS 4113	Traffic signal lamps – Lamps for 240 V a.c. operation
ITS-10	Mains Power Supply
DDPSM vol 2	<i>Drafting and Design Presentation Standards Manual, Volume 2</i>
	<i>Manual of Uniform Traffic Control Devices (MUTCD) for Queensland</i>
RPDM	<i>Road Planning and Design Manual</i> – published by Transport and Main Roads
TRUM	<i>Traffic and Road Use Management Manual</i> – published by Transport and Main Roads

3.2 Standard Drawings

Table 3.2 lists the Standard Drawings referenced in this document or relevant to the design, construction, maintenance and operation of Traffic Signals.

Table 3.2 – Referenced Standard Drawings

Drawing Number	Title
1149	Traffic Signals/Road Lighting/ITS – Ducts for Underground Electrical and Communications Conduit
1314	Traffic Signals/Road Lighting – Pit – Drainage Details
1323	Traffic Signal/ Road Lighting – Luminare terminal panel
1327	Traffic Signals/Road Lighting – Mains Connection
1333	Traffic Signals/Road Lighting – Minimum Clearance of Overhead Electric Lines from Ground and Structures
1377	Traffic Signal/Road Lighting – Joint Use Traffic Signal and Road Lighting Pole
1396	Traffic Signal/Road Lighting – Joint Use Traffic Signal and Road Lighting Pole Installation Details
1403	Traffic Signals – Mast Arm Footing Installation Details.
1404	Traffic Signals – Mast Arm Anchor Cage Fabrication Details.
1407	Traffic Signal/Road Lighting – Traffic Signal Terminal Panel for Joint Use Poles
1408	Traffic Signal/Road Lighting – Traffic Signal Terminal Panel for joint use poles wiring details
1411	Traffic Signals – Mast arm road lighting junction box (type B)
1412	Traffic Signals – Road Lighting Junction Box (Type B) Wiring Details
1413	Traffic Signals – Terminal Panel Traffic Signal Junction Box (Type A)

Drawing Number	Title
1414	Traffic Signals – Traffic Signals Junction Box (Type A) Wiring Details
1415	Traffic Signals/Road Lighting – Circular Cable Joining Pit 600 Diameter
1416	Traffic Signals/Road Lighting – Collar for 600 Diameter Circular Cable Joining Pit
1417	Traffic Signals/Road Lighting – Cover for 600 Diameter Circular Cable Joining Pit Drawing 1 of 2 and Drawing 2 of 2
1418	Traffic Signals/Road Lighting – Cable Junction Box Supporting Strap
1420	Traffic Signals – Traffic Signals Components
1421	Traffic Signals – Traffic Signals Post Footing Installation Details
1422	Traffic Signals – Rag-bolt Sub-Assembly Fabrication Details
1423	Traffic Signals – Controller Base Installation Details
1424	Traffic Signals – Detector Loops Installation Details In Asphalt Pavement
1425	Traffic Signals – Detector Loops Placement Details
1427	Traffic Signals – ‘U’ Series Mast Arm Installation Details
1428	Traffic Signals – Base Mounted Signals Post Installation Details
1434	Traffic Signals/Road Lighting – Cable Guard Manufacturing Details
1436	Traffic Signals/Road Lighting – Cable Guard Manufacturing Details
1437	Traffic Signals – Hinged Base Plate for Traffic Signal Post Fabrication Details
1438	Traffic Signals – Hinged Base Plate For Traffic Signal Post Installation Details
1439	Traffic Signals – Lantern Designations, Functions & Aiming
1440	Traffic Signals/Road Lighting – Pit-Concrete Surround
1630	Traffic Signals/Road lighting – Conduit Entry Details into Circular Pits
1631	Traffic Signals/Road Lighting – Cable Joining Pit Types 1 (J), 3, 4, 7 & 8
1632	Traffic Signals – Cable Joining Pit Cover Type 1 (J)
1633	Traffic Signals/Road Lighting – Cable Joining Pit Cover Types 3 & 4
1634	Traffic Signals/Road Lighting – Cable Joining Pit Cover Types 7 & 8
1635	Traffic Signals – Traffic Signal Terminal Panel Type 2
1700	Traffic Signals – VID detector Loops Installation Details
1701	Traffic Signals – Detector Loops Details – Counting Loops and Diode Connection
1702	Traffic Signals – Detector Loops Motorways and Ramp Placement and Installation Details
1703	Traffic Signals – Red Light Camera Cable and Loop Details
1704	Traffic Signals – Red Light Camera Wiring Details

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 Standards*.

The Hold Points, Witness Points and Milestones applicable to this Technical Standard 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.	Certified by a RPEQ	Submission of designs (28 days).
7.2	2. Changes to approved design		
11.3		Cutting slots for detector loops.	
12.2		Modification to controller.	
12.3		EPROM personality verification.	
13.2		Cable laying.	
14		Mains power connection.	
15.1.1	3. Salvage of items of traffic signal equipment.		Submission of schedule of items to be salvaged (7 days).
15.1.3	4. Approval prior to removal of items to be salvaged which cause damage		
16.1	5. Commencement of compliance testing.		Submission of compliance testing procedure (28 days).
16.2	6. 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 Standard shall comply with the requirements of the Act and subordinate legislation and AS/NZS 3000.

A Licensed Electrical Contractor shall be engaged to perform the duties and functions of "electrical works" as defined in the Act.

An Electrical Engineer shall be engaged to perform the duties of design work within the scope of this standard.

6 MATERIALS AND EQUIPMENT

6.1 General

All materials shall comply with the requirements of this Standard and the details shown on the Standard Drawings nominated herein and/or the Drawings on the Main Roads web page.

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 ITS & Electrical Technology Branch; Type approved products.

6.2 Traffic Signal Equipment

Equipment shall be supplied and manufactured in accordance with the requirements of the Specifications or the Australian Standards listed in Table 6.2.

Table 6.2 – Traffic Signal Equipment Specifications or Standards

Specification or Standard	Component
ES-102	Detector Loops, Feeder cable
ES-103	Detector loop cable
ES-101	Multicore power cables
ES-115	Pedestrian push buttons
ES-108	Traffic Signal Controllers
ES-109	Traffic signal lanterns
AS 4113	Traffic signal lamps
MRTS78	Traffic signal mast arms
ES-114	Traffic signal posts

6.3 Road Lighting Equipment

Road lighting components not specifically described in this Standard 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 number 1413. Column mounted road lighting junction boxes shall comply with details shown on Standard Drawing number 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 number 1624 (for single phase supply) and 1625 (for 3 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 number 1407; and
- b) road lighting terminal panels – Standard Drawing number 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

Cement mortar shall consist of 1 part of Type GP cement and 3 parts of clean sharp sand with just sufficient water added to form a moist mortar suitable for dry packing.

7 DESIGN BY THE CONTRACTOR

7.1 Submission of Design

Where design of the Traffic Signal installation is undertaken by the Contractor, the requirements of Clause 7 shall apply.

Not less than 28 days prior to the proposed installation of traffic signal equipment, lanterns and/or poles, the Contractor shall submit to the Administrator, a traffic signal design which complies with the requirements of the RPDM, this standard and relevant Standard Drawings listed in Table 3.2. **Milestone** The design shall be submitted in accordance with the provisions of the Contract governing design by the Contractor. As a guidance note; that if the Contractor chooses to divide the work into lots as per MRTS50 then it is recommended that all of the traffic signal equipment at each intersection be considered as one lot. Generally, the MRTS91, MRTS94 or MRTS95 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, Queensland. **Witness Point**

Construction under this Standard 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 shall be subject to the provisions of Clause 7 and referred to the engineer responsible for the original design. Only after all the requirements of this Standard have been satisfied shall such changes be incorporated in the Works. **Hold Point 2**

7.3 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 to 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 and 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.

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

8.2 Traffic Signal Posts

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

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

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

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

8.3 Traffic Signal Mast Arms

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

A traffic signal junction box shall be installed on the pole in accordance with Standard Drawing number 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 holding-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 luminare spigot which is not to be used immediately, the 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 number 1427.

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.

Where this is the case, 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 number 1427.

The road lighting luminare cable shall be installed from the pit to the open end of the luminare 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 number 1377.

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 dry cement mortar. The edges of the mortar shall be finished in accordance with the details shown on Standard Drawing number 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 Standard.

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 number 1420 shall be maintained.

9.3 Lantern Mounting Straps

Lantern mounting straps shall be supplied and installed in accordance with the requirements of AS 2339.

Where standard straps provided with lanterns are not of a suitable length, they shall be replaced with straps of the required 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

Appropriately sized target boards shall be attached to traffic signal vehicle lanterns using the attaching devices supplied.

9.6 Aiming of Lanterns

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

10 INSTALLATION OF PEDESTRIAN PUSH BUTTONS

10.1 General

Pedestrian push buttons shall be installed with relevant accessories as shown in the Drawings or as otherwise specified in this Standard.

10.2 Mounting Height

Mounting heights for pedestrian push button assemblies shall be as shown in the Drawings.

10.3 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.

10.4 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.

10.5 Audio-Tactile Drive Units

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

11 INSTALLATION OF VEHICLE DETECTOR LOOPS

11.1 General

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

11.2 Loop Configuration

Loop configurations shall be as shown in the Drawings.

11.3 Installation of Loop

Vehicle detector loops shall be installed in accordance with the details shown on Standard Drawing number 1424.

Slots of width 5 mm shall be cut in the pavement surface using –

- a) for asphalt surface, a water cooled diamond tipped blade; and
- b) for a spray sealed surface, a carborundum blade used dry.

The slot shall be cut to sufficient depth so that a minimum cover of 15 mm is provided to the detector loop cable when installed.

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**

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.

When the cable has been completely installed, the slot shall be backfilled with filter sand to a depth just below the top of the slot. An anionic bituminous emulsion complying with MRTS21 *Bituminous Emulsion* shall be poured into the slot and allowed to filter through the sand. The remainder of the slot shall then be filled with filter sand to the finished level of the pavement and emulsion applied again. If subsidence occurs, the process shall be repeated as necessary to ensure loop installation is flush with finished road level.

11.4 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*.

11.5 Pits

Unless otherwise shown in the Drawings, vehicle detector loop pits shall be installed against the kerb or on the pole alignment as appropriate. Pits shall conform to the requirements of MRTS91 *Conduits and Pits*.

11.6 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.

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.

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.

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

Where so stated in Clause 2 of Annexure MRTS93.1, existing traffic signal controllers shall be modified in accordance with the requirements stated in that Clause 2 of Annexure MRTS93.1. Such modification may include –

- a) the supply and installation of additional components;
- b) the removal of existing components; and
- c) reprogramming of the EPROM.

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

12.3 Supply and Installation of personality EPROM

A certificate verifying the functionality of personality EPROM modules shall be submitted to the Administrator prior to commencement of testing of any traffic signal installation. **Witness Point**

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 MRTS95 *Switchboards and Cables*, without intermediate joints. **Witness Point**

A minimum of 6 metres of slack multi-core cable shall be coiled in each pit adjacent to traffic signal controllers, posts, mast arms and joint use poles and two metres in all intermediate pits.

13.3 Terminations

Terminal connections of traffic signal cables shall be carried out as shown in the 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 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 MRTS95 *Switchboards and Cables*. **Witness Point** Where specified in the Drawings mains power shall be provided to the site in accordance with ITS-10.

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 7 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 7 day period. **Hold Point 3**

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, Administrators approval shall be obtained for any procedure which may cause damage. **Hold Point 4**

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 so as 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 Standards*.

16 COMPLIANCE TESTING

16.1 Testing Procedure

Not less than 28 days prior to commencement of testing of traffic signal equipment, the Contractor shall submit to the Administrator its compliance testing procedure. **Milestone**

Compliance testing shall not commence until expiration of the 28 day period. **Hold Point 5**

16.2 Testing Requirements

The Contractor is responsible for carrying out sufficient testing to ensure that materials and construction standards comply with this Standard and the requirements of the Act. Electrical tests shall include at least the mandatory tests detailed in AS/NZS 3000 and earth fault loop impedance tests.

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

- a) isolation and resistance test, testing of lanterns, flash test, loop continuity and numbering test, push button conductivity and numbering and controller connections to mains power; and
- b) phase and timing testing of the installation.

Compliance testing shall be carried out in the presence of the Administrator. **Hold Point 6**

The following documents shall be included in the quality records –

- a) a Certificate of Test and Compliance;
- b) a Record of Inspection and Tests; and
- c) accurate as-constructed drawings.

17 SUPPLEMENTARY REQUIREMENTS

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