DELIVERING FOR QUEENSLAND

Technical Specification

Transport and Main Roads Specifications
MRTS92 Footings for Road Lighting, Traffic Signal and Roadside Equipment Mounting Structures

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Queensland Government

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1 Introduction

This Technical Specification applies to the construction of concrete footings and related works required for the installation of:

- road lighting poles rate 2 and rate 3
- pathway lighting poles
- CCTV poles
- joint use poles
- traffic signal mast arms
- combination traffic signal mast arms, and
- traffic signal posts, and traffic signal controllers.

This Technical Specification does not apply to installations owned by others.

> This Technical Specification is written for common, well-defined applications. Footings for other posts and poles may require additional detailing in design.

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

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

1.1 Registered products and suppliers

The requirements for the construction of concrete footings and related works include the use of registered products and suppliers. For information regarding these products and suppliers refer to the Transport and Main Roads website, Bridges and Other Structures - Approved products and registered suppliers, or email Structures Construction Materials (TMRStructuralMaterials@tmr.qld.gov.au).

2 Definition of terms

The terms used in this Technical Specification shall be as defined in Clause 2 of MRTS01 *Introduction to Technical Specifications*. In addition, terms listed in Table 2 are applicable to this Technical Specification.

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 defined in Clause 14 of MRTS01 *Introduction to Technical Specifications*
Electrical Works	As defined in the Act
Licensed Electrical Contractor	Holder of an Electrical Contractor License under the Act
Rate 2 Lighting	Public lighting owned and maintained by the Electricity Entity
Rate 3 Lighting	Public lighting supplied, installed, owned and maintained by Transport and Main Roads

3 Referenced documents

The requirements of the referenced documents listed in Table 3 below apply to this Technical Specification. Where there are inconsistencies between this Technical Specification and the referenced documents, the requirements specified in this Technical Specification shall take precedence.

Table 3 - Referenced documents

Reference	Title
MRTS01	*Introduction to Technical Specifications*
MRTS04	*General Earthworks*
MRTS50	*Specific Quality System Requirements*
MRTS56	*Construction Surveying*
MRTS63A	*Piles for Ancillary Structures*
MRTS70	*Concrete*
MRTS71	*Reinforcing Steel*
MRTS78	*Fabrication of Structural Steelwork*
MRTS91	*Conduits and Pits*
MRTS97	*Mounting Structures for Roadside Equipment*
MRTS278	*Supply of Structural Fasteners*
SD1149	*Traffic Signals / Road Lighting / ITS – Installation of Underground Electrical and Communications Conduit*

Reference	Title
SD1328	*Road Lighting / ITS – Lighting / Camera Pole Anchor Cage Fabrication Details (Drawing 1 of 2 to Drawing 2 of 2)*
SD1380	*Road Lighting – Slip Base Mounted Pole – Footing Details for Installation in the Median*
SD1381	*Road Lighting – Slip Base Pole and Footing Installation details for Crossfalls up to and including 1:6*
SD1382	*Road Lighting – Slip Base Pole and Footing Installation details for Crossfalls greater than 1:6 up to and including 1:3*
SD1392	*Road Lighting – Base Plate Mounted Pole and Footing Installation details for Crossfalls up to and including 1:2*
SD1393	*Road Lighting – Base Plate Mounted Pole – Footing Details for Installation on Slopes of greater than 1:2*
SD1395	*Road Lighting – Base Plate Mounted Pole and Footing within Concrete Barrier – footing Details and Installation of Pole*
SD1396	*Traffic Signals / Road Lighting – Base Plate Mounted Joint Use Pole – Footing Details for Installation on Slopes of up to and including 1:6*
SD1403	*Traffic Signals – Mast Arm – Footing Details and Installation*
SD1404	*Traffic Signals – Mast Arm Anchor Cage Fabrication Details (Drawing 1 of 2 to Drawing 2 of 2)*
SD1421	*Traffic Signals – Traffic Signals Post and Footing Installation details*
SD1422	*Traffic Signals – Ragbolt Sub-Assembly Fabrication details*
SD1423	*Traffic Signals – Traffic Signal Controller Base Installation details*
SD1429	*Road Lighting – Slip Base Mounted Pole – Footing Details for Installation using Concrete Step Tread on Slopes of Greater Than 1:6 up to and including 1:3*
SD1437	*Traffic Signals – Hinged Base Plate for Traffic Signal Post Fabrication details*
SD1438	*Traffic Signals – Hinged Base Plate for Traffic Signals Post Installation*
SD1680	*Traffic Signals / Road Lighting – Extension to Light Pole and Mast Arm Anchor Cages*
SD1683	*Pathway Lighting – Anchor Cage Fabrication and Installation details*
SD1684	*Road Lighting / ITS – Base Plate Mounted Hinged Pole – Footing Details for Installation on Slopes of up to and including 1:2*
-	*Electrical Safety Act 2002*

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 and Witness Points applicable to this Technical Specification are summarised in Table 4.1. There are no Milestones defined.

Table 4.1 – Hold Points, Witness Points and Milestones

Clause	Hold Point	Witness Point	Milestone
7.2	1. Location of footing		
7.4	2. Inspection by the Administrator prior to installing the anchor cage	1. As constructed survey to confirm the depth of footing	
7.5.7	3. Placing concrete		
7.5.9		2. Construction of retaining structures on slopes	

4.2 Conformance requirements

The conformance requirements that apply to each footing or slab base covered by this Technical Specification are summarised in Table 4.2.

Table 4.2 – Conformance requirements

Clause	Conformance requirement for each footing
7.2	As Constructed Survey undertaken to confirm set out at correct coordinates, to prescribed tolerances, and existing utility services investigation
7.2	As Constructed Survey undertaken to confirm revised set out at adjusted coordinates, where the Administrator has agreed to vary the original location
7.4	Depth of excavation to confirm design depth has been achieved
7.5.3	Slip base pole anchor cage installation shall be checked before placing concrete
7.5.5	Tolerances for anchor cage installed in concrete barriers
7.5.7	Base plate mounted pole or mast arm anchor cage installation shall be checked before placing concrete

4.3 Compliance with electrical legislation

The work covered by this Technical Specification shall comply with the Part 3: *Electrical Design for Roadside Devices*, Volume 4: *Traffic and Road Use Management Manual* (TRUM). The Contractor shall engage a Licensed Electrical Contractor to perform the duties and functions of 'electrical works' as defined in the Act. This includes installation of pits and conduits.

5 Design of footings

Design life of footings for poles, post, mast arms shall be 50 years.

6 Materials

6.1 Road lighting Rate 2

For Rate 2 road lighting, materials shall comply with the requirements of Energy Queensland as well as any relevant local Electricity Entity policies or Standards.

6.2 Traffic signals and road lighting Rate 3

6.2.1 Anchor cage / ragbolt assembly, traffic signal controller base connections, and hinged base plate

The reinforcing steel, steelwork, and associated fasteners required for the installations as listed in Clause 1 shall be in accordance with MRTS71 *Reinforcing Steel*, MRTS78 *Fabrication of Structural Steelwork*, and MRTS278 *Supply of Structural Fasteners*, and with the following Standard Drawings:

a) SD1328 for road lighting, ITS or joint use installations on base plate mounted or slip base mounted poles

b) SD1404 for traffic signal mast arms

c) SD1422 for ragbolt sub-assembly fabrication

d) SD1423 for traffic signal controller base connections

e) SD1437 for hinged base plate, if required, shall be used with SD1422, for traffic signal posts, and

f) SD1683 for pathway lighting

All anchor cages, and rag-bolt assemblies shall be supplied complete with nuts and washers in accordance with the appropriate Standard Drawing.

A template shall be supplied with ragbolt assemblies.

6.3 Conduit

Electrical conduit shall comply with the requirements of MRTS91 *Conduits and Pits*.

6.4 Concrete

Concrete shall comply with the requirements specified in MRTS70 *Concrete* and relevant Standard Drawing.

7 Construction

7.1 General

Footings shall be in accordance with this Technical Specification, the project specific design documentation, and the details shown on the appropriate Standard Drawing as follows:

a) For road lighting, CCTV or joint use pole installations using anchor cage detailed on SD1328, refer to SD1380, SD1381, SD1382, SD1392, SD1393, SD1395, SD1396 SD1429, or SD1684

b) For mast arm installations using anchor cage detailed on SD1404, refer to SD1403

c) For traffic signal post installations using ragbolt detailed on SD1422, refer to SD1421

d) For traffic signal controller installations refer to SD1423, and

e) For pathway lighting installations refer to SD1683.

7.2 Location of footing

Setting out shall be undertaken by a competent surveyor as prescribed in Surveyor competency of MRTS56 *Construction Surveying* and meet the relevant survey control requirements as prescribed in Survey control of MRTS56 *Construction Surveying*.

The footing locations shall be set out in accordance with the details provided in the design documentation matching the reference point on the Standard Drawing complying to MRTS01 *Introduction of Technical Specifications* and MRTS56 *Construction Surveying*.

Each footing shall be accurately located, with minimum setbacks in relation to face of kerb, pram ramp, pit location, footpath, road furniture, batter hinge, median barrier and existing and proposed PUP prior to commencement of excavation of that footing.
Hold Point 1

The utility service investigation shall include but not be limited to the following activities:

a) Request for copies of drawings showing existing services adjacent to the footing locations from "Before You Dig Australia", service authorities and Local Government, and

b) Pot holing (excavations) over the existing utility services to verify their alignment and levels.

The Administrator may direct amendment to the actual location for the footing from that shown in the design documentation so that existing utility services are not compromised. In this instance, the amended location shall be recorded in accordance with the requirements of this Technical Specification and MRTS01 *Introduction of Technical Specifications* and MRTS56 *Construction Surveying*.

7.3 Depth of footing

Footing shall be constructed to at least the depth shown on the appropriate Standard Drawing for good or average soil type encountered on site.

Specialist design is required for the footing depth in poor soil type as shown in Table 7.3.

Footings on slopes greater than the prescribed range shall require specialist design.

An experienced Geotechnical Engineer shall determine the soil type encountered at the footing location based on the strength parameters shown in Table 7.3. The Geotechnical Engineer shall decide if any ground investigation is required to determine the soil strength parameters.

Table 7.3 – Soil strengths parameters for different soil types

Soil Type	S_u	Definition
Good Soil	$S_u \geq 50$ kPa	Stiff to Hard Clayey Materials or Weathered Rocks
Average Soil	25 kPa $\leq S_u < 50$ kPa	Firm Clayey Materials or Compacted Earth fill Materials
Poor Soil	$S_u < 25$ kPa	Very Soft to soft Clayey Materials

Note:

S_u = Undrained Shear Strength

Embedment depth required into Poor Soils or Sandy materials (e.g., Loose Sand, Medium Dense Sand and Dense to Very Dense Sand) shall be designed by a Geotechnical Engineer

7.4 Excavation

Footings for poles and mast arms shall be excavated using earth augers of the appropriate size or other similar techniques that shall result in a neat hole of the minimum size shown on the Standard Drawings.

The excavation shall be surveyed to confirm the depth of footing as prescribed in MRTS56 *Construction Surveying*. The placement of the anchor cage shall not be undertaken until the As Constructed Survey requirements have been met and notice of such Works provided to the Administrator. **Witness Point 1**

The excavation shall be inspected by the Administrator prior to installation of the anchor cage **Hold Point 2**

Other than for situations described in Clause 7.4.1, the footings described in this Technical Specification shall not be formed up.

Where footings are required in or adjacent to existing excavations or footing excavations become too large, the excavation shall be backfilled with suitable material and compacted in accordance with the requirements of MRTS04 *General Earthworks*. The footing excavation shall then be carried out in accordance with this clause.

Surplus excavated material shall be disposed of in accordance with the requirements of MRTS04 *General Earthworks*.

7.4.1 Formwork

It is permissible to use formwork up to 1000 mm in collapsible soil.

Formwork shall be provided for traffic signal controller slab base to the dimensions and strength required to achieve the project specific shape shown in the design documentation.

7.5 Installation of anchor cage / ragbolt assembly / holding down bolts

7.5.1 General

Anchor cages, ragbolt assemblies and holding down bolts shall be suspended in the correct position, at the correct orientation and at the heights shown on the appropriate Standard Drawing.

The method of suspension shall be such that the anchor cage, ragbolt assembly or holding down bolts remain in the correct location and bolts remain vertical during placement and vibration of concrete.

7.5.2 Tolerance check

Conformance tolerance checks for footing heights, holding down bolt heights, and if required; offset distance from centre of anchor cage to face of kerb shall be undertaken by a Surveyor after completion of all assemblies.

7.5.3 Slip Base Poles

For slip base poles, to ensure the correct level of the slip plane, the anchor cage installation shall be checked for tolerance conformance as stated in Clause 7.5.2 before placing concrete.

Slip base mount assembly including the base plate shall not be buried except for the special case stated on the SD1380.

7.5.4 Footings for Hinged Base Plate for Traffic Signal Posts

The ragbolt and the top of footing for traffic signal posts installed with a hinged base plate shall be set at an appropriate lower level to accommodate the hinged base plate, as shown on SD1438.

7.5.5 Tolerances for anchor cage installed in concrete barriers

The anchor cage for installations using SD1395 shall be positioned in accordance with the following tolerances:

a) centre of cage

   ± 3 mm centre of concrete barrier, transversely, and

   ± 50 mm at the nominated chainage, longitudinally.

b) top of bars

   240 mm ± 10 mm above projected finished surface height at the centre of the concrete barrier at the nominated chainage.

c) verticality

   1.15° from vertical (20 mm per meter as per MRTS63A *Piles for Ancillary Structures*).

7.5.6 Conduit

Conduit shall be installed under the supervision of a Licensed Electrical Contractor at the location shown on the project design documentation, and in accordance with the requirements of this Technical Specification, MRTS91 *Conduits and Pits* and SD1149, and the appropriate Standard Drawing.

Conduit within the footing shall end flush with top of mortar pad.

Mortar pad shall be flush with the bottom of the base plate.

For installations within concrete barrier using SD1395, only one 50 mm diameter conduit is required within the mortar.

7.5.7 Placing concrete

Concrete shall be placed, compacted and cured in accordance with MRTS70 *Concrete*.

Concrete shall not be dropped from a height of more than 3 m.

All care should be taken to reduce this drop height to a minimum, and that the hole is stable, no water is present in the hole, and the tie wires, reinforcing and formwork cannot be moved by the falling concrete.

Concrete shall not be placed until the excavation, formwork, anchor cage, ragbolt assembly or holding down bolts and conformance checks have been inspected by the Administrator. **Hold Point 3**

7.5.8 Curing concrete

Concrete shall be allowed to cure for a period of at least 7 days or until a minimum concrete strength of 20 MPa has been demonstrated by testing before erection of the pole, mast arm or post.

7.5.9 Retaining structures

Where required to retain the soil at the pole footing, an appropriate retaining structure shall be supplied and installed in accordance with the details shown on SD1382 or SD1393 or SD1429. **Witness Point 2**

The base of the structure shall have 1-in-50 slope for free drainage to outlet made in lower side.

SD1429 details the use of concrete step tread as an alternative retaining structure, for situations as noted on that drawing, is offered as an alternative to SD1382, and shall not be used in locations where there is potential for injury to workers from the star pickets or the step tread installation.

8 Precast footing

Precast footing shall not be used for the installation of road lighting, traffic signals and roadside mounting structures.

9 Conformance and as constructed survey

All the surveying requirements associated with the installation of new or relocated traffic signal and road light footings are comply with MRTS56 *Construction Surveying*.

Conformance requirements are to be fulfilled as prescribed in MRTS56 *Construction Surveying*.

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