



ACT
Government

TRAFFIC SIGNALS 13

MUNICIPAL
INFRASTRUCTURE
TECHNICAL
SPECIFICATION
13 - TRAFFIC SIGNALS

Transport Canberra and
City Services

July 2019



Publication Number:	MITS 13 Edition 1 Revision 0
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Date of Effect:	July 2019
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Supersedes:

Endorsed By:	Karl Cloos	Director, Infrastructure Planning
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Approved By: Ken Marshall Executive Branch Manager, Roads ACT

Document Information

Document	Key Information
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Document Title	MITS 13 Traffic Signals
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Next review date	
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Key words

AUS-SPEC Base Document	
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Revision Register

Edition/ Revision Number	Clause Number	Description of Revision	Authorised By	Date
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1/0

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1 TRAFFIC SIGNALS

1.1 General

1.1.1 Responsibilities

1.1.1.1 Objectives

Supply and installation of all traffic signals equipment, as documented in the contract drawings and in accordance with the relevant ACTSD and this Specification.

All material and procedures, where not otherwise specified shall be in accordance with Australian Standard Specifications where such exist, and in their absence with the current Roads and Maritime Services (RMS), NSW QA Specification for the Installation and reconstruction of traffic light signals.

All materials and equipment shall have the current RMS, NSW approvals.

1.1.1.2 Precedence

Where any document except legislation or the Territory Plan issued in conjunction with this Specification includes technical requirements that conflict with this document the requirements of this Specification take precedence.

1.1.2 Cross references

The following documents are related to this specification:

1.1.2.1 Legislation

Road Transport (General) Act

Road Transport (Safety and Traffic Management) Act

Road Transport (Mass, Dimensions and Loading) Act

Road Transport (Safety and Traffic Management) Regulation

Territory Plan and related Codes

1.1.2.2 Specifications

Requirement: Conform to the following

MITS 00 Preliminaries

MITS 01 Traffic Management

MITS 03 Underground services

1.1.2.3 Design Standards

General: The following Design Standards are related to this Specification:

MIS 01 Road planning and design

MIS 13 Traffic Control Devices

ACTSDACT Standard Drawings - as referenced through this specification

1.1.2.4 TCCS Reference Documents

General: The following TCCS reference documents are related to this Specification:

- Reference document 7 Operational acceptance submissions
- Reference document 8 Works as executed quality records
- Reference document 9 Final acceptance submissions
- Reference document 11 Drafting Standard for Civil and Landscape works

1.1.3 Referenced documents

1.1.3.1 Standards

General: The following documents are incorporated into this Specification by reference:

- AS 1428 Code of practice for design rules for access by the disabled
 - AS 1906 Part 1: Retroreflective materials
 - AS 2053 Non metallic conduits and fittings
 - AS 2144 Traffic signal lanterns
 - AS 2276.1 Cables for traffic signal installations – Multicore power cables
 - AS 2276.2 Cables for traffic signal installations – Feeder cable for vehicle detectors
 - AS 2276.3 Cables for traffic signal installations – Loop cable for vehicle detectors
 - AS 2339 Traffic signal posts and attachments
 - AS 2353 Pedestrian push button assemblies
 - AS 2578 Traffic signal controllers: Part 1: Physical and electrical compatibility
 - AS 2703 Vehicle loop detector sensors
 - AS 2979 Traffic signal mast arms
 - AS 3000 SAA wiring rules
 - AS 3100 Definitions and general requirements for electrical materials and equipment
 - AS 3147 PVC insulated electric cables and flexible cables
 - AS 4680 Hot-dip galvanised (zinc) coatings on fabricated ferrous articles
 - AS 4049.3 Waterborne paint- For use with surface applied glass beads
- Roads and Maritime Services (NSW)
RMS QA Specification SI/TCS/8 Installation and reconstruction of traffic light signals

1.1.3.2 Other publications

Proprietary products: To *TCCS Products previously considered for use list*

1.1.4 Interpretation

1.1.4.1 Abbreviations

General: For the purposes of this Specification the following abbreviations apply:

- CATSS:** Canberra Automated Traffic Signal System
- NATA:** National Association of Testing Authorities.

RMS: NSW Roads and Maritime Services
TCCS: Transport Canberra and City Services.

1.1.4.2 Definitions

General: For the purposes of this Specification the definitions given below apply:

Authorised Person: Person or body responsible for administering the works contract. May include Principals Authorised Persons, Superintendent’s Representatives or any other parties in accordance with the works contract

Primary lantern: A traffic signal lantern that faces an approach that is located to the left, right or overhead of the stop line for that approach.

Standard Compaction: Nominated percentage as determined by AS 1289.5.7.1 or AS 1289.5.4.1 for standard compactive effort.

1.1.5 Submissions

1.1.5.1 General

Submissions: To the Authorised Person for approval.

Approvals: Conform to **Hold and witness points**.

Drawings: Prepare any drawings and other documentation including temporary traffic management plans, asset sheets to record extent and constitution of final works in accordance with Ref 08 and submit electronic TCD documentation in accordance with *Reference document 11 Drafting Standard for Civil and Landscape works*.

1.1.6 Hold points and witness points

1.1.6.1 Notice

General: Give written notice so that the documented inspection and submissions may be made in accordance with the **Hold point table**.

Table 13-1 Hold point table

Item	Clause title	Requirement	Notice for inspection	Release by
Pre Construction planning				
13.1	Quality plan and Temporary traffic management plans.	Submission of a quality plan including a program, temporary traffic management plans, resourcing and inspection and test plans	7 days prior to scheduled work commencement	Authorised Person
Traffic signal posts, erection				
13.2	Set out of posts.	Notification that the posts have been marked out on site	2 working days prior to scheduled work commencement	Authorised Person witnessed by the Road Authority Traffic Signal Unit

Item	Clause title	Requirement	Notice for inspection	Release by
13.3	Installation of posts.	Submission of evidence that all traffic signal equipment needed for the completion of the signal installation is available, the civil works have advanced to the stage where all components can be installed without creating a traffic hazard and set-out of posts is clearly marked on site	1 day prior to scheduled commencement of signal post installation.	Authorised Person
13.4	Inspection of posts prior to backfill.	Notification that the posts have been installed (prior to backfilling)	2 working days prior to backfilling	Authorised Person

Control equipment, General

13.5	Controller compliance with RMS specifications for SCATS operation	Submission of the documentation proving compliance of the controller with the RMS specifications for SCATS operation.	5 days prior to installation of the controller	Authorised Person
13.6	Request for signal personality module	Submission of the documentation proving request to the Road Authority Traffic Signal Unit for provision of the signal controller personality module	10 days prior to bench testing the controller	Authorised Person
13.7	Commissioning of Controller	Submission of the documentation proving that the signal controller has been bench tested and confirmation of onsite commissioning date	2 days prior to installation of the controller	Authorised Person witnessed by the Road Authority Traffic Signal Unit
Cabling, General				
13.8	Details of cable testing	Submission of the documentation proving the cable has been tested and fully meets the requirements of AS 2276.1 and AS 2276.2.	3 days prior to the commencement of cable installation	Authorised Person

1.2 Pre-construction planning

1.2.1 Traffic management

General: Take all necessary steps to avoid or minimise delays and inconvenience to all users of the road reserve or open space area during the course of the work but without compromise to the safety of the employees and the public or quality of the works.

Plan: Submit a Temporary Traffic Management Plan for endorsement in conformance with *MITS 01 Traffic Management*.

2 SIGNAL POSTS AND ATTACHMENTS

2.1 General

Standard: To AS 2339

Requirements: Traffic signals tubular steel posts and attachments shall conform to the following:

- > The location of the signal posts and mast arm supports shall be as shown on *ACTSD-3901, 3912 and 3914* unless otherwise specified on the contract drawings.
- > The installation of signal posts, joint use posts and mast arms shall conform to the contract drawings.

2.2 Traffic signal posts

2.2.1 Foundations

Requirements:

- > The foundations for the signal posts shall be constructed in accordance with the details shown on *ACTSD-3912* unless otherwise specified on the contract drawings.
- > Prior to placing concrete, the bottom of the excavation is to be compacted to 98% Standard Compaction.
- > The holding down rag bolts shall be accurately set prior to pouring concrete and the surface of the footing is to be trowelled smooth and a bedding of sand/ cement mortar prepared for the base plate as shown on the contract drawings.

2.2.2 Erection

Requirements.

- > Erection details are to be as shown on *ACTSD-3912* unless otherwise specified on the contract drawings.
- > Erection of the signal post shall not commence until 48 hours have elapsed since placing the concrete foundation.
- > The signal post shall be made vertical by means of the four levelling nuts under the base plate and secured by equal tension on the upper set of nuts.

Submission of documentation certifying conformance with the requirements is a **HOLD POINT**.

Erection at awnings: The Contractor shall be wholly responsible for providing and making good any holes through awnings, which may be necessary for the erection of the signal post. 25mm min clearances all round shall be left between the signal post and the awning and finished such that water from the awning cannot flow into the opening. Any alterations to the awning shall be carried out by a qualified plumber.

Unpaved areas: Signal posts in unpaved areas will be provided with a 700mm square cover slab 50mm thick as shown on *ACTSD-3912*. The top of the slab shall be trowelled smooth and finished to divert water away from the post.

Signal posts in paved surfaces: Where the signal post is placed in an existing footpath or median with a paved surface, a construction joint shall be formed to define the extent of the concrete slab surrounding the signal post. The surface shall be neatly and squarely trimmed and finished to the levels of the adjacent pavement.

Backfill: After the erection of signal posts and after all cables have been installed, excavations shall be backfilled as specified in *MITS 03G Service conduits*.

2.2.3 Joint use posts

Requirements: Joint use posts shall comply with:

- > Streetlight cabling shall be to Electricity Authority and the Road Authority requirements for streetlight cabling. Joint use posts shall be fitted with mounting brackets suitable for attaching vehicular and pedestrian lanterns and push button assemblies.
- > Streetlight cabling shall be connected to the traffic signal controller and may be a single phase cable.
- > No earth strap is required for combined use posts.
- > Provide an approved Traffolyte or approved equal label (5mm minimum height white on red lettering) securely fixed within the streetlight panel access door advising "24 Hour Electrical Supply".
- > Luminaire shall have an integral PE Cell.
- > Required height and orientation are to be as shown on the contract drawings.
- > Door requirements for joint use posts are as shown on *ACTSD-3915*.

Footings: Joint use footings shall be in accordance with the standard drawings and manufacturers requirements.

Double-davit mast arms: shall comply with the details as shown on *ACTSD-3915*.

Unpaved areas: Joint Use posts in unpaved areas will be provided with a 700mm square cover slab 50mm thick as shown on *ACTSD-3912*. The top of the slab shall be trowelled smooth and finished to divert water away from the post.

Joint Use posts in paved surfaces: Where the signal post is placed in an existing footpath or median with a paved surface, a construction joint shall be formed to define the extent of the concrete slab surrounding the signal post. The surface shall be neatly and squarely trimmed and finished to the levels of the adjacent pavement.

2.2.4 Cabling

Requirements:

- > Cable shall be installed with 2.0m of spare cable left coiled in the pit box at the base of each signal post.
- > Adequate provision shall be made for the replacement of the inter connection cables without disturbing the post foundations.

2.3 Mast arms

2.3.1 Type

Requirement: Mast Arms shall conform to the following:

- > AS 2979 and shall be Type 3A, Region A as shown in the standard.
- > The details as shown on *ACTSD-3915*.

2.3.2 Foundation

Requirements:

- > All concrete work shall comply with the requirements of *AS 1480*.
- > All concrete shall be 32Mpa minimum 28 day compressive strength.
- > The top surface of the base is to be dressed with a wooden float to a smooth even surface, unless detailed otherwise.

2.3.3 Erection

Requirement: The erection of the mast arm shall not commence until 7 days have elapsed since the pouring of the concrete footings.

2.3.4 Positioning

Nominal positioning: The mast arm shall be positioned 1.5 metres from the post centre to the kerb line. If a conflict arises the position has a tolerance of between a minimum of 1.2 metres to a maximum of 2.0 metres from the post centre to the kerb line.

2.3.5 Cabling

Requirements:

- > The inter connecting cables from other signal posts shall be terminated in a terminal assembly fitted within the main upright of the mast arm and accessible when standing on the adjacent surrounds.
- > The cabling shall be completely enclosed within the mast arm.
- > All lantern cables shall be terminated at the ground access point.

3 VEHICLE SIGNAL LANTERNS, BRACKETS AND TARGET BOARDS

3.1 General

Requirements:

- > All lanterns are to be LED CLS (Central Light Source) unless approved otherwise by the Road Authority.
- > Standard multi aspect and single aspect lanterns, target boards and brackets shall conform with the requirements of *AS 2144*.
- > The vehicle signal lanterns shall be attached to signal posts, or other post types, poles indicated on the contract drawings.
- > Where vehicle lanterns are attached to supports, the brackets shall be constructed from mild steel and then cadmium plated. Bracket lengths shall be kept to the minimum practical length and be consistent throughout the intersection.
- > Provide approved lock washers to all vehicle signal lanterns.

3.2 Positioning

Requirements: Vehicle lantern assemblies are to be positioned to ensure:

- > The assemblies including cowls are a minimum of 300mm clear of the kerb line.
- > The signal indications being displayed on the primary vehicle lanterns (i.e. the first vehicle lanterns for a particular approach) are continuously and clearly visible at all distances on the approach from 150m to 15m from the stop line.

Grouping arrangements: The vehicle lantern cross section and attachment facilities shall be such that an arrangement, consisting of three vehicle lanterns and two pedestrian lanterns, can be grouped on a signal post within a reasonable area and aligned to provide:

- > An unobstructed view of the intended signal face to any pedestrian on the associated marked foot crossing.
- > Sufficient clearance between lanterns so that the lantern doors may be opened through 90 degrees without fouling adjacent lanterns.
- > Cowl requirements: Provision shall be made for a cowl to be fitted to each optical system.
- > Unless otherwise specified, vehicle lanterns shall be supplied complete with cowls and target boards with a white edge strip.
- > Louvres shall also be supplied where specified.

Material selection: Materials shall be selected or adequately treated to prevent corrosion, particularly with respect to galvanic action.

Moisture ingress requirements:

- > The optical system shall be proofed against the ingress of moisture or foreign material.
- > Drainage provision shall be made for any water which accidentally enters any part of the vehicle lantern including the optical system to escape to the exterior.

Assembly attachments:

- > All positioning attachments shall be capable of being locked in position other than by friction alone.
- > The vehicle lanterns shall be provided with mounting straps, screws and nuts suitable for attachment to a standard signal post.
- > All 1 and 2 aspect vehicle lanterns shall be housed in a 3 aspect lantern body. The lantern shall be supplied with blanking doors fitted in the unused aspects.

3.3 Temporary lantern covers

At the time of erection and until the time of signal commissioning all vehicular traffic signals lanterns shall be covered with a Traffic Signal out-of-service testing lantern cover as shown on *ACTSD-3916*.

The lantern covers shall be removed when approved by the Road Authority at the time of signal commissioning.

4 PEDESTRIAN SIGNAL LANTERNS

4.1 General

Standard: To AS 2144.

Lanterns: All lanterns to be LED CLS (Central Light Source) unless approved otherwise by the Road Authority.

Attachment to signal posts:

- > The pedestrian signal lanterns shall be attached to signal posts by upper and lower mounting brackets, or if attached to a signal post supporting a vehicle signal lantern, by two lower mounting brackets. Bracket lengths shall be kept to the minimum practical length and be consistent throughout the intersection.
- > Where pedestrian signal lanterns are attached to other supports, the brackets shall be constructed from mild steel and then cadmium plated.
- > Provide approved lock washers to all pedestrian signal lanterns.

4.2 Positioning

Requirements: Pedestrian signal lantern assemblies are to be positioned to ensure:

- > The assemblies including cowls are a minimum of 300mm clear of the kerb line.
- > Pedestrians have a clear indication of the signal from the opposite side of the carriageway.
- > The pedestrian signal lantern door may be opened through 90 degrees without having to shift the signal lantern.

5 PEDESTRIAN PUSH BUTTON ASSEMBLIES

5.1 General

Standard: To AS 2353

Use: In conjunction with marked foot crossings for the purpose of registering pedestrian demands.

Requirements: Push button assemblies are to be constructed as follows

- > Include standard and / or audio tactile as specified in the contract documents.
- > Constructed in accordance with details shown on *ACTSD-3912*.
- > Positioned in accordance with the contract drawings, parallel to, and on the same side of the signal post as the associated path crossing.
- > Positioned such that push buttons are located at a height of 1.0m +/- 10mm above the adjacent pavement traversed by the path user.
- > The arrow disc on the pedestrian push button assemblies orientated so that the arrow(s) point(s) in the direction of the associated marked foot crossing.
- > Arrows on push buttons shall be in accordance with the contract drawings.

Wiring: All wiring to push button assemblies shall be in 4V 75 sheathed cable, having 2 cores 7/0.50 gauge in addition to an earthing conductor, complying with AS 3147.

Wiring colours: The standard colours for the 3 insulated cores shall be allocated in the following manner:

Red (or brown)	Push button active
Blue	Common (ELV) Return

6 VEHICLE DETECTOR SENSORS

6.1 General

Standard: To AS 2703.

7 CONTROL EQUIPMENT

7.1 General

Standard: To AS 2578.

Requirements: The Controller is to be supplied to conform to the following:

- > Be fully compatible with the RMS, NSW "SCATS" dynamic area traffic control software and hardware system as used in the Canberra Automated Traffic Signal System.
- > Be of the latest RMS firmware standard.
- > Capable of controlling the number of signal groups, detector loops and contact inputs control as specified in the contract documents.
- > Equipped with the required telecommunication line termination facilities, including the line termination box, terminals, modem, access door and keys, the isolation transformer and associated circuitry, the telecommunication line conduit and the lead and plug to connect the telecommunication line to the communication port of the controller and sufficient memory to operate in CATSS mode. The modem type shall be compatible with the telecommunications provider infrastructure and software and the Contractor shall liaise with the Traffic Signals Unit prior to ordering the equipment.
- > Compatibility with CATSS and of a type accepted by the RMS, NSW as an acceptable SCATS Controller.

Commissioning requirements:

- > Liaise with the Traffic Signals Unit for provision of the Controller personality module.
- > Controller is to bench tested with communications to SCATS for a minimum period of 48 hours.
- > Liaise with the Traffic Signals Unit for onsite attendance by the Traffic Signals Unit during the onsite commissioning of the signals.

Submission of documentation certifying conformance with the requirements is a **HOLD POINT**.

7.2 Physical requirements

7.2.1 Housing

7.2.1.1 General

Requirement: The housing shall be constructed to the details as shown on *ACTSD-3913* and comprise the weatherproof enclosure for the protection of the computer, interfacing equipment, power supplies and associated components. The controller housing shall be fitted with an approved proprietary housing extension which will house communications and ITS equipment.

7.2.1.2 Doors

Requirements:

- > The controller housing door shall be fitted with two Bi-locks with the Key Code MK1.
- > The door lock for the cabinet extension shall be fitted with a Bi-lock with the Key Code SC1. The head of the fasteners shall be fully recessed into the door.
- > Contact the Road Authority Traffic Signal Unit for an authorisation letter for supply of one key for each lock. The locks are only available from Class Locksmiths.
- > The tapered mating sections on the housing shall be self aligning with the movement of tolerance of the door in respect to the housing.
- > When locked or fully tightened, the door shall be held securely against the weatherproof gaskets to provide a weatherproof seal.
- > The door shall open and close freely without binding on any portion of the housing.
- > Upon commissioning of the controller housing one door key is to be supplied to the Road Authority Traffic Signal Unit for each lock for each Controller.

7.2.2 Telecommunication line connection

Requirements: The telecommunication line connection to the housing shall conform to the following:

- > Consist of 25mm diameter telecommunication conduit positioned to match the corresponding conduit cast into the concrete controller base. Provide a draw wire between controller housing and the telecommunication pit
- > Constructed to the details as shown on *ACTSD-3913*.
- > Constructed to meet the requirements of the telecommunication authority and the Authorised Person.

7.2.3 Facility switch

Requirement: One facility key shall be supplied with each controller and upon commissioning shall be supplied to the Road Authority Traffic Signal Unit.

7.3 Installation

Requirements: The controller housing shall be constructed as follows:

- > Installed, located and oriented and with a concrete base installed as shown on *ACTSD-3913*.
- > The exposed concrete of the controller base shall be finished to dressed timber or steel form to a class 3 finish.
- > Positioned to ensure good alignment of the conduit providing for the connection of the telecommunication conduit to the controller. The Controller housing shall be secured to the footing using galvanised rag bolts as shown on *ACTSD-3913* (Masonry or chemical anchors are not permitted).
- > The surface of the concrete apron shall include a light broom finish.

8 CABLING

8.1 General

Standards:

- Multi-core power cables and feeder cables for detector loops are to conform to the requirements of AS 2276.1 and AS 2276.2.
- Conduits carrying cables shall comply with *MITS 03G Service conduits*.

Requirement: Before the installation of any cables certification the cable has been tested and fully meets the requirements of AS 2276.1 and AS 2276.2.

Submission of documentation certifying conformance with the requirements is a **HOLD POINT**.

8.2 Cable conduits

Cable conduit requirements:

- > JC-1 small conduit junction boxes; a single uPVC conduit with a minimum of 50mm internal diameter shall be used where installation of twin screened cable running between a JC-1 small conduit junction box and a JB-R large conduit junction box is specified. The cable conduit is to terminate 25mm inside the junction box
- > JB-R junction boxes: 2 x uPVC conduits with 140mm external diameter shall be used for all cabling between JB-R junction boxes and terminate 25mm inside the junction box. One of these conduits shall be available for street Lighting cable if required.
- > Signal posts; a single 100mm external diameter uPVC conduit between a JB-R junction box and a signal post and connect to the signal post foundation conduit.
- > Signal controller; 2 x 140mm external diameter uPVC conduits shall be provided for cabling running between a JB-R junction box and the signal controller and connect to the controller base conduit.
- > Joint use poles; a single 100mm external diameter uPVC conduit shall be provided for cabling running between a JB-R junction box and a joint use pole and connect to the pole conduit.

Minimum depths: The minimum depth of cover to conduit below the roadway, footpath or median surfacing shall be 600mm and 750mm under roadways.

Changes in direction: No angles are allowed in conduit runs. Where a change in direction in a conduit run is necessary due to site conditions and an additional junction box is not practical, a bend of minimum radius 450mm and not exceeding an angle of 45 degrees may be used.

8.3 Cable installation

Preparation:

- > Prior to the pulling in of the cables a steel mandrel shall be drawn through each conduit to clear it of any foreign material.
- > A 2.0mm galvanised draw wire shall be left in the conduit at the completion of the conduit installation.

Cable installation requirements:

- > The cable sheath shall be removed for an adequate length and cable cores neatly formed and laced to allow all individual cores to be connected to the appropriate numbered terminal.
- > In the Controller housing each core shall be appropriately labelled for identification as to its function in accordance with the Cable Connection Chart.
- > All earth wires are to be joined by twisting together and soldering.
- > Each multi core cable shall be clearly identified at the Controller housing and each signal post top.
- > At least 2.0m of excess cable shall be provided in junction boxes adjacent to each signal post and Controller housing.

9 VEHICLE DETECTOR LOOPS

9.1 General

Standard: Loop cable for vehicle detector loops to *AS 2276.3*.

Installation requirements:

- > Vehicle and scooter bicycle detector loops shall be installed to the details as shown on *ACTSD-3911*.
- > Slots for vehicle detector loops shall be saw cut as shown on the contract drawings. A minimum asphalt thickness of 100mm is required.
- > Immediately prior to the installation of the cable, the slot shall be thoroughly cleaned with compressed air and dry.
- > The loops shall be wound in the configuration as shown on the contract drawings.
- > The loop cable shall be pressed into the bottom of the slot and wedged with pieces of softwood or similar material which will not damage the cable or its insulation and will hold the cable in position.
- > The slots shall then be filled flush with the road surface with “Scotech” loop sealant or similar and any excess sealant that flows on to the road surface shall be removed.

Cable jointing:

- > The jointing of the loop and feeder cables shall be carried out in a junction box situated on the footpath or median.
- > The loop and feeder cables shall be jointed by twisting together and soldering at a terminal block located in the junction box.
- > All completed connections shall be sealed by use of heat shrink caps or equal as specified on *ACTSD-3911*.
- > It is important that the joint between the two core screened cable and the loop cables be water proofed to prevent entry of moisture into the interstices of the two core screened cable. Adequate precautions shall be taken to prevent entry of moisture into the two core screened cable before the joint is finally sealed.

Identification requirements: Each loop and the ends of each loop cable shall be clearly marked for identification using the numbering system as shown on the contract drawings or by default as detailed on *ACTSD-3902*.

10 JUNCTION BOXES

10.1 Types

Junction box requirements:

- > Construction details of all junction box types are shown on *ACTSD-3914*.
- > For detector cables - JC 1 telecommunication (small type) boxes.
- > For all other cables - JB R junction boxes as shown on the contract marked "TRAFFIC SIGNALS" in accordance with the details shown on *ACTSD-3914*.
- > For the telecommunication SCATS connection – a JC telecommunication (small type) box marked "TELECOMMUNICATION" is to be provided.

10.2 Installation

Requirements:

- > Junction boxes should be positioned and installed as indicated on *ACTSD-3901 and 3914* unless shown otherwise on the contract drawings.
- > JB R junction boxes are to be installed in accordance with the details shown on *ACTSD-3914*
- > All holes for entry of cable conduits shall be neatly drilled to match the outside diameter of the conduit. Any gaps between the junction box wall and entry conduit shall be sealed with a sealant approved by the Authorised Person.
- > Any gaps between the top of a JB-R junction box wall and the underside of the frame for the lid shall be sealed with cement mortar.
- > All dirt and foreign matter shall be removed from the box prior to the completion of the works.

11 COMPLETION

11.1.1 Submissions

Work as Executed Records: To *MIT5 00B Quality Requirements*.

12 MEASUREMENT AND PAYMENT

12.1 Measurement

12.1.1 General

Payments made to the Bill of Quantities: To *MIT5 00A General requirements*, this Specification, the drawings and **Pay items**.

12.1.1.1 Methodology

The following methodology will be applied for measurement and payment:

- > Allow for all work, materials, testing and quality assurance requirements in each Pay Item.
- > Concrete footings: Paid under this Specification and not *MIT5 06B Paths, Driveways and Medians*.

12.2 Pay items

Table 13-2 Pay items table

Item No	Pay items	Unit of measurement	Schedule of rates scope
13.1	Traffic signal post	Per traffic signal post installed	All costs associated with excavation in all types of materials encountered including rock, installation of holding down bolts, construction of concrete foundation and provision of concrete apron, supply and installation of traffic signal post.
13.2	Pedestrian / Cyclist push-button post	Per Pedestrian / Cyclist push-button post installed	All costs associated with excavation in all types of materials encountered including rock, installation of holding down bolts, construction of concrete foundation and provision of concrete apron, supply and installation of pedestrian / cyclist push-button post.
13.3	Mast arm post	Per mast arm post including outreach arm	All costs associated with excavation in all types of materials encountered including rock, installation of holding down bolts, construction of concrete foundation, installation of mast arm post complete with outreach arm. A separate pay items shall be included for each outreach arm size.

Item No	Pay items	Unit of measurement	Schedule of rates scope
13.4	Mast arm and streetlight post	Per mast arm including streetlight post	<p>All costs associated with excavation in all types of materials encountered including rock, installation of holding down bolts, construction of concrete foundation, installation of mast arm post complete with traffic signal and streetlight outreach arms.</p> <p>A separate pay item shall be included in the contract for each streetlight column height, Streetlight outreach arm length and Traffic signal outreach arm length. For example;</p> <p>13.4.1 10.5m light col/ 4.5m light outreach/ 8.5m signal outreach</p>
13.5	Joint use post	Per joint use post installed	<p>All costs associated with excavation in all types of materials encountered including rock, installation of holding down bolts, construction of concrete foundation, installation of joint use post complete with outreach arms.</p> <p>A separate pay item shall be included in the contract for each streetlight column height, Streetlight outreach arm length. For example;</p> <p>13.5.1 10.5m light col/ 4.5m light outreach</p>
13.6	Vehicle signal lanterns	Per signal lantern set installed	<p>All costs associated with the supply and installation of each set of LED CLS (Central Light Source) vehicle signal lanterns, screens, cowls, brackets, target boards and temporary covering of lanterns.</p> <p>The pay item description shall be 13.6.A.B where:</p> <p>A = Set type</p> <p>1 = Single aspect vehicle signal lantern 2 = Three aspect vehicle signal lantern 3 = Four aspect in line vehicle signal lantern 4 = Four aspect L configuration vehicle signal lantern 5 = Five aspect vehicle signal lantern 6 = Six aspect vehicle signal lantern</p> <p>B = Optic diameter</p> <p>2 = 200mm diameter 3 = 300mm diameter</p> <p>For Example 13.6.2.2 = Three aspect vehicle signal lantern 200mm diameter</p>

Item No	Pay items	Unit of measurement	Schedule of rates scope
13.7	Pedestrian signal lanterns	Per pedestrian signal lantern installed	All costs associated with the supply and installation of each set of LED pedestrian signal lanterns, cowls and brackets. 13.7.1 Pedestrian lantern 13.7.2 Pedestrian and cycle lantern
13.8	Pedestrian push button assemblies	Per pedestrian push button assembly installed	All costs associated with the supply and installation of a pedestrian push button assembly and for audio tactile push button assemblies, the cost of the associated driver unit. 13.8.1 Standard push button assembly (non audio) 13.8.2 Audio tactile push button assembly
13.9	Control equipment	Per control equipment installed	All costs associated with the supply and installation of a traffic signal controller inclusive of foundation in all types of materials including rock, apron, housing, telecommunications and electricity connections, vehicle detector sensor units and modem. The tendered rate shall include all cost associated with commissioning the traffic signals to the Superintendents and the Road Authority approval including liaison with the Road Authority.
13.10	Control cabinet extension	Per control cabinet extension installed	All costs associated with the supply and installation of an approved proprietary traffic signal cabinet extension.
13.11	Multi-core cabling	Linear metre of cable installed	All costs associated with the supply and installation of multi-core cabling, including loop cable identification and all connections.
13.12	Twin screen cabling	Linear metre of cable installed	All costs associated with the supply and installation of twin screen cabling, including loop cable identification and all connections.

Item No	Pay items	Unit of measurement	Schedule of rates scope
13.13	Cable conduit	Linear metre of conduit installed	<p>All costs associated with the supply of cable conduits and required bends, trenching in all types of materials including rock, laying of conduit in trench or structure, end caps, connection to junction boxes, backfilling and compaction of trenches and the provision of a draw wire in each conduit.</p> <p>A separate pay item shall be included in the Contract for each type of cable conduit type and configuration.</p> <p>13.13.1 1 x 50 dia. Conduit 13.13.2 1 x 100 dia. Conduit 13.13.3 1 x 140 dia. Conduit 13.13.4 2 x 140 dia. Conduit</p>
13.14	Vehicle detector loops	Per detector loop installed	<p>All costs associated with the supply and installation of detector loops in the pavement.</p> <p>13.14.1 Vehicle detector loop 13.14.2 Passage detector loop 13.14.3 Cycle Scoot loop</p>
13.15	JC-1 Small conduit junction box	Per JC-1 small conduit junction box installed	<p>All costs associated with the supply and installation of JC-1 junction box inclusive of excavation in all types of materials including rock, provision for conduit entry, backfill, lid, and path and verge reinstatement.</p>
13.16	JB-R Large conduit junction box	Per JB-R large conduit junction box installed	<p>All costs associated with the supply and installation of JB-R large junction box inclusive of excavation in all types of materials including rock, provision for conduit entry, backfill, lid complete with concrete apron, and path and verge reinstatement.</p>
13.17	Installation and connection of communications cable to new Signal Controller	Provisional Sum	<p>All activities associated with the connection to the telecommunications infrastructure within the telecommunications pit, provision of new telecommunications conduits and jointing pits, connection to new controller and commissioning of the cabling.</p> <p>The pay item shall also allow for liaison with the telecommunications provider and include all fees payable.</p> <p>All works are to be undertaken by a Telecommunications provider or their approved Contractor including liaison.</p>

Item No	Pay items	Unit of measurement	Schedule of rates scope
13.18	Installation and connection of Power Supply cable by Evoenergy to new Signal Controller	Provisional Sum	<p>All activities associated with the supply and installation of electrical cable, connection to existing infrastructure and the new controller and commissioning of the cable.</p> <p>The pay item shall also allow for liaison with Evoenergy and include all fees payable. All works are to be undertaken by Evoenergy.</p>



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July 2019