P43 Specification for Traffic Signals
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P43 SPECIFICATION FOR TRAFFIC SIGNALS

1 GENERAL

1.1 Scope and Foreword

1.1.1 Exclusions
This document is intended as a technical specification for the installation of traffic signals. Compliance with this specification does not indicate compliance with any other legal or contractual requirements (eg traffic management, health & safety requirements etc).

1.2 Objectives
While this specification is intended to encompass the best practice for the supply and installation of traffic signals throughout the country, it is recognised that individual Road Controlling Authorities (RCA) will have their own specific requirements. Therefore, this specification needs to be read in conjunction with the Regional Special Conditions to P43, as produced by the local RCA in which the work is being undertaken.

1.3 Interpretation
For the purposes of this specification, the word 'shall' refers to requirements that are essential for compliance with the specification, while the word 'should' refers to practices that are advised or recommended.

This specification includes a number of appendixes. These appendixes are supplied to allow the provision of greater detail without filling the specification with diagrams.

All appendixes are an integral part of the specification, unless specifically marked as 'Informative'.

RCA's may provide different details than those shown in the appendixes. In that case, it will be noted in the RCA Regional Special Conditions if an appendix is to be considered informative in that region.

1.4 Purpose of this specification
This document has been produced by the Signals NZ User Group (SNUG), and continues to be maintained and updated by the SNUG committee.

This specification sets out the details for the selection and installation of equipment involved with the installation of traffic signals and associated systems.

Compliance with this specification will ensure that traffic signal installations will operate reliably, and in a consistent manner, regardless of installation location.

REFERENCED DOCUMENTS
The users of this specification should ensure that their copies of the following documents are the latest revisions.

Reference is made in this document to the following:

NEW ZEALAND STANDARDS

NZS 3109        Concrete construction
NZS 3114        Specification for concrete surface finishes
NZS 3404  Steel structures standard (Parts 1 & 2)
NZS 3910  Conditions of contract for building and civil engineering construction

JOINT AUSTRALIAN/NEW ZEALAND STANDARDS

AS/NZS 1163  Cold-formed structural steel hollow sections
AS/NZS 1170:-  Structural design actions
    Part 0:2002  General principles
    Part 1:2002  Permanent, imposed and other actions
AS/NZS 1554:-  Structural steel welding
    Part 1:2011  Welding of steel structures
AS/NZS 2144:2002  Traffic signal lanterns
AS/NZS 2276:-  Cables for traffic signal installations
    Part 1:2004  Multicore power cables
    Part 2:1998  Feeder cables for vehicle detectors
    Part 3:2002  Loop cable for vehicle detectors
AS/NZS 2312  Guide to the protection of structural steel against atmospheric corrosion by the use of protective coatings
AS/NZS 2980  Qualification of welders for fusion welding of steels
AS/NZS 3000  Electrical wiring regulations
AS/NZS 4058  Precast concrete pipes
AS/NZS 4676  Structural design requirements for utility services poles
AS/NZS 4677  Steel utility services poles
AS/NZS 4680  Hot-dip galvanized (zinc) coatings on fabricated ferrous articles

INTERNATIONAL STANDARDS

IEC 60947:-  Low-voltage switchgear and controlgear
    Part 7-1:2009  Ancillary equipment – Terminal blocks for copper conductors
IEC 60998:-  Connecting devices for low-voltage circuits for household and similar purposes
    Part 1:2002  General requirements
    Part 2-1:2002  Particular requirements for connecting devices as separate entities with screw-type clamping units

AUSTRALIAN STANDARDS

AS 2339:1997  Traffic signal posts and attachments
AS 2353  Pedestrian push button assemblies
AS 2578:2009  Traffic signal controllers
AS 2700  Colour Standards for General Purposes
AS 2703  Vehicle loop detector sensors
AS 3996  Access covers and grates

OTHER PUBLICATIONS

NZECP 34  New Zealand code of practice for electrical safe distances
RTS14  Guidelines for installing pedestrian facilities for people with vision impairment (NZTA Publication)
CoPTTM  Code of practice for temporary traffic management (NZTA Publication)
Austroads Part10  Guide to traffic engineering management, Traffic Control and communication devices
RMS TSC/4  Compliant controller specification
NZTA  Pedestrian planning and design guide
### 1.5 Definitions and abbreviations

#### 1.5.1 Definitions

For the purpose of this specification, unless inconsistent with the context, the following definitions apply.

<table>
<thead>
<tr>
<th>Term</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Engineer</td>
<td>As Per NZS 3910 “Conditions of contract for building and civil engineering construction”</td>
</tr>
<tr>
<td>Client</td>
<td>As Per NZS 3910 “Conditions of contract for building and civil engineering construction”</td>
</tr>
<tr>
<td>Contractor</td>
<td>As Per NZS 3910 “Conditions of contract for building and civil engineering construction”</td>
</tr>
<tr>
<td>RCA Traffic Signal Engineer, Also referred to as Signal Engineer</td>
<td>The RCA Traffic Signal Engineer is ultimately responsible for traffic signals for the RCA. This person is a technical person, and is not generally associated with the contract. They are the Traffic Signal Engineer who will be operating the installation once it is completed. Larger RCA’s have delegated this responsibility to Transport Operations Centres (TOC’s). It is the traffic signal contractor’s responsibility to verify who the RCA Traffic Signal Engineer is before any work commences.</td>
</tr>
</tbody>
</table>
1.5.2 Abbreviations

Abbreviations used in this specification have the following meaning. The singular includes the plural and the plural includes the singular.

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>CIS</td>
<td>Controller Information Sheet</td>
</tr>
<tr>
<td>DLP</td>
<td>Defects Liability Period</td>
</tr>
<tr>
<td>ELV</td>
<td>Extra Low Voltage</td>
</tr>
<tr>
<td>HHT</td>
<td>Hand Held Terminal</td>
</tr>
<tr>
<td>JUMA</td>
<td>Joint Use signal Mast Arm and streetlight pole</td>
</tr>
<tr>
<td>JUSP</td>
<td>Joint Use signal and Streetlight Pole</td>
</tr>
<tr>
<td>KJB</td>
<td>Kerbside junction box</td>
</tr>
<tr>
<td>LED</td>
<td>Light Emitting Diode</td>
</tr>
<tr>
<td>MCB</td>
<td>Miniature Circuit Breaker</td>
</tr>
<tr>
<td>MPa</td>
<td>Megapascals</td>
</tr>
<tr>
<td>NATA</td>
<td>National Association of Testing Authorities (Australia)</td>
</tr>
<tr>
<td>NZTA</td>
<td>New Zealand Transport Agency</td>
</tr>
<tr>
<td>PROM</td>
<td>Programmable Read-Only Memory (controller configuration)</td>
</tr>
<tr>
<td>PVC</td>
<td>Polyvinylchloride</td>
</tr>
<tr>
<td>RAMM</td>
<td>Remote Asset Maintenance Manager</td>
</tr>
<tr>
<td>RCA</td>
<td>Road controlling authority</td>
</tr>
<tr>
<td>RCD</td>
<td>Residual Current Device</td>
</tr>
<tr>
<td>RMS</td>
<td>Roads &amp; Maritime Services (the developers of SCATS)</td>
</tr>
<tr>
<td>SCATS</td>
<td>Sydney Co-ordinated Adaptive Traffic System</td>
</tr>
<tr>
<td>SPT</td>
<td>Special Phase Time</td>
</tr>
<tr>
<td>TMP</td>
<td>Traffic Management Plan</td>
</tr>
<tr>
<td>TRAFF</td>
<td>Internal Operating System for Traffic Signal Controller</td>
</tr>
<tr>
<td>UMB</td>
<td>Upper mounting bracket</td>
</tr>
</tbody>
</table>
2  MINIMUM REQUIREMENTS OF SIGNAL EQUIPMENT

2.1 General
Section 2 sets out the requirements of all signal equipment offered for supply and installation, including the local signal controller, controller cabinet, detectors, lanterns, target boards, visors, poles and pole top assemblies, and push button assemblies.

2.2 Signal equipment compliance and approvals
All traffic signal components shall comply with this specification and shall either:

(a) Have been previously supplied to the road controlling authority (RCA) or client, and found satisfactory in operation, or
(b) Be demonstrated in a working condition, and given approval by the RCA Traffic Signal Engineer before the closing date for tenders. The Engineer may give provisional approval if, in the RCA Traffic Signal Engineer’s opinion, the equipment is fit for purpose and is able to be connected to the Sydney co-ordinated adaptive traffic system (SCATS) traffic management system (if required to be connected to SCATS). See Section 2.2.1.

The equipment shall also comply with all relevant electrical regulations and local power supply authority’s requirements.

2.2.1 Provisional approval
Provisional approval for non-complying equipment may be given by the RCA Traffic Signal Engineer for Regional Approval providing it can be shown that the proposed equipment meets all specified requirements, including safety and other regulatory requirements, and provides the same desired outcome.

Equipment with provisional approval is required to operate in accordance with this specification, and the associated regions special conditions. This will not remove the contractor’s maintenance obligations under Sections 4 and 5. In many cases, equipment with provisional approval may require maintaining for a longer period than 1 year. The contractor will be notified of this period when granted provisional approval. Maintenance, at no cost to the RCA or client, will be required until full approval for the equipment is given.

In general, equipment will be required to operate under normal working conditions without failure for a period of 12 months. This may apply to one-off, or a multiple number, of units.

2.2.2 Guarantee / Warranty period
Unless specified elsewhere in this specification, all equipment and hardware supplied or installed shall be guaranteed by the manufacturer against faulty materials and workmanship for a minimum period of [1] year from the date of commissioning.

The guarantee period commences from the date of commissioning and not the date of manufacture.

Where there is a difference between the main contract’s defects and liability requirements and this specification, the longer time period shall apply.

Exceptions to the above include: traffic signal controller components (as per manufacturer), poles, and painting (10 years).

LED (lamp) modules shall have a 5-year guarantee period. For new installations, the guarantee period shall commence from the date of commissioning. For replacement modules, the guarantee period shall commence from the date of installation of the LED (lamp) module.
For new installations, commissioning of the signals shall be deemed to have occurred on the date when the installation has passed all of the pre-commissioning tests and the RCA Traffic Signal Engineer has signed the site acceptance (or similar) form.

All guarantee and warranty work must be done at no cost to the asset owner, or their representative.

See Section 5 for cost liabilities for any failure or fault during the contract maintenance or defects liability period.

2.3 Traffic signal controller

2.3.1 AS 2578:2009 - Traffic signal controller
Subject to the following special conditions, the traffic signals controller shall comply with AS 2578. This includes all aspects of the controller, cabling, mounting, cabinet, and logic rack as detailed in AS 2578, including the provision of options as detailed in Appendix A of AS 2578.

2.3.2 New Zealand special conditions to AS 2578:2009
The following amendments shall be made to AS 2578 for supply and installation in New Zealand under P43. The numbers referred to are the clause numbers in AS 2578.

1.4.10 – Additional requirement for New Zealand
In accordance with AS/NZS 3000, the RCD supplied shall meet the conditions of 2.6.2.2 of AS/NZS 3000 for New Zealand installations.

2.3.3 – Additional requirement for New Zealand
The controller should have ventilation grilles in the base, above the finished ground level, and below the gland plate as detailed in 2.3.4. A recommended option is to fit a ‘pedestal’ between the base and the controller cabinet. This pedestal shall be at least 100 mm tall, and the same width and depth as the controller cabinet and base.

2.3.4 – Additional requirement for New Zealand
A gland plate and removable access panel shall be fitted at the bottom of the controller cabinet. A suitable example is shown in this specification Appendix L. Any unused cable entries shall be ‘plugged’ with plugs that can be easily removed. The glands, gland plate, and access panel shall prevent entry of vermin and so on into the bottom of the controller cabinet.

The access panel shall be installed to allow easy removal for maintenance tasks in the bottom of the cabinet.

2.3.7 – For New Zealand delete Figure 2.5.
2.3.7 – Additional requirement for New Zealand as per NOTE.
The purchaser requirement for New Zealand cabinet locking is as follows:

(a) Recessed handle(s);
(b) Three-point locking at top, bottom, and side;
(c) A single-key mechanism; with the lock keyed for FS880, unless specified by the local RCA’s regional amendments to P43.

2.3.12 – Change requirement for New Zealand
Replace second paragraph with –
The equipment shelf shall be mounted not less than 390 mm below the top of the door opening, and this shelf shall be the width of the controller cabinet.

Clause 2.3.12 – Additional requirement for New Zealand
The equipment shelf shall be sufficiently deep enough to hold the logic module, but shall have at least 50 mm clearance from the front face to the inside of the door.
New clause for New Zealand
Communications socket outlet and MCB
A circuit breaker shall be installed in the ‘spare position’ defined in AS2578:2009, Section 2.5.11(f). This circuit breaker shall be rated at 16 A, Type C, with a fault-make load-break fault current rating not less than 8 kA, and shall control a new double-socket outlet specifically for communications and camera equipment, where the 230 V power for such equipment is supplied by 3-pin plug. The communications equipment socket outlet shall be clearly labelled ‘Communications equipment only – NOT RCD PROTECTED’. RCD protection shall not be provided for this socket.

New clause for New Zealand
Street lighting power
Where there is a power supply to street-lighting fed through the traffic signals cabinet, it shall be installed as per the local RCA’s regional amendments to P43. This street lighting circuit shall be supplied through the traffic signal controller mains power isolation switch. The ‘Detector’ MCB detailed in Section 2.5.11 (d) may be reassigned as the street-lighting circuit protection.

New clause for New Zealand
Electricity revenue meter
Each electricity retailer and each electricity lines company has slight variations with their electricity revenue meter requirements. For regional specifics, consult the local RCA’s regional amendments to P43.

2.13.1 – Change requirement for New Zealand
Replace the entire paragraph with –
Conformance with New Zealand communication requirements
Any device designed or intended for connection to a telecommunications network shall comply with the applicable requirement:

(a) Telepermit requirements - Any device to be directly connected to the Chorus network shall display the New Zealand Telepermit label. For more information visit http://www.telepermit.co.nz.

(b) Radio requirements - Any wireless device shall comply with the (New Zealand) Radiocommunications Act. For more information visit http://www.rsm.govt.nz.

2.18 – NOTE
The service light is a standard requirement for all New Zealand controllers.

2.22.5 (b) – change requirement for New Zealand
Replace entire requirement with ‘Telepermit label and PTC number’.

2.3.3 Controller firmware
Prior to testing and installation, the following requirements shall be met:

(a) The controller shall be designed in accordance with the Roads and Maritime Services (RMS) TSC4 specification;
(b) The controller (including logic rack and all other modules) shall have the current manufacturer software, firmware, and hardware updates applied at the time of installation.

2.3.4 SCATS compliance and TRAFF version
Where the controller is to be connected to SCATS, the following conditions apply:

(a) The controller shall be running the latest version of TRAFF software, as notified by RMS;
(b) A copy of the RMS SCATS compatibility certificate for that model of controller shall be supplied to the RCA Traffic Signal Engineer, if requested or not previously supplied.
2.3.5 New controller types
Where a contractor proposes to install a new controller type not previously installed in the area of the RCA, the following conditions shall be met:

(a) Written approval shall be obtained from the RCA Traffic Signal Engineer;
(b) The supplier (or their agent) shall offer to make a presentation on the controller to the RCA Traffic Signal Engineer, and provide a loan logic rack at no charge to allow the RCA Traffic Signal Engineer to test the controller and become familiar with it;
(c) The supplier (or their agent) shall provide a training course to the RCA’s existing maintenance contractor, at no charge to the engineer or the maintenance contractor;
(d) If the new controller requires special configuration tools, or will not work with the RCA’s maintenance contractor’s HHT, the supplier (or their agent) shall provide all equipment required to allow full HHT operation with the controller. This may include computer hardware & software, or a new HHT, as required by the RCA Traffic Signals Engineer to integrate with the operations of the current maintenance contractor;
(e) The RCA Traffic Signal Engineer has the final right to deny installation of any controller type in their area.

2.4 Signal lanterns

2.4.1 General
The technical requirements for traffic signal lanterns including cowls, visors, and louvres shall be as stipulated in AS/NZS 2144, including amendments as issued from time to time, with the exception that all new traffic signal lanterns shall be supplied with LED lamps.

2.4.2 Signal sizes
The nominal size of pedestrian and general-purpose signals, as referred to in 3.3 of AS/NZS 2144, shall be 200 mm.

The nominal size of extended range signals, as referred to in 3.3 of AS/NZS 2144, shall be 300 mm.

Extended range signals shall be used on all overhead mast arm displays and on high speed approaches.

2.4.3 LED lanterns
All LED lanterns, visors, louvres and target boards shall comply with this specification. In addition LED lanterns shall have an independent NATA certified laboratory report confirming compliance with AS/NZS 2144. This must be supplied to the RCA Traffic Signal Engineer on request.

2.4.4 Lantern body construction
Lantern bodies shall be constructed from aluminium and be installed to the manufacturers’ installation instructions.

The lantern doors shall be capable of being hinged on both the left and right without the need for tools. Lantern doors shall be able to be replaced without the need to disturb the lantern mountings.

2.4.5 Visors (cowls)
Each visor shall fit tightly against the door and shall not permit any perceptible filtration of light between the door and the visor.

All visors shall be made from plastic.

Unless specified elsewhere, all visors shall be one of the following:

(a) Open type visor – For use on primary lanterns;
(b) Closed type visor – For use on secondary or tertiary lanterns;
(c) Pedestrian visor – Each standard 200 mm diameter pedestrian lantern shall be fitted with an approved rectangular visor.

2.4.6 Target boards (backing boards)
Target boards shall be fitted to each vehicle lantern supplied. The target boards shall be as specified in AS/NZS 2144, and shall be constructed using type 5005 aluminium alloy with a minimum thickness of 1.6 mm. Each target board shall be fully interchangeable in accordance with the criteria recommended in Appendix F of AS/NZS2144:2002. The surface treatment shall be baked enamel (black). All target boards shall incorporate a white border as detailed in AS/NZS2144.

2.5 Poles (posts) and pole terminal assemblies

2.5.1 Traffic poles
The design requirements for all traffic poles shall be in accordance with AS/NZS 4676 and AS/NZS 4677.

Design of the components for strength will be in accordance with the parameters set out in (a) to (g).

Only standard poles and arms in accordance with the drawings in Appendix A are to be manufactured. Variations from these standards will require written approval from the RCA’s Traffic Signals Engineer.

All traffic poles, including mast arm poles, standard traffic signal and hinged traffic signal poles, JUMA, JUSP, ground planted, flange based, or flange based stub shall be designed in accordance with AS/NZS 1170.0 and AS/NZS 1170.1, and include a 10-year structural guarantee.

Additionally, the following specific design parameters are to be included:

(a) Design working life – 50 years;
(b) Importance level – 2;
(c) Wind region – Use code for region where traffic signals are to be installed;
(d) Terrain/height multiplier – 2;
(e) Shielding multiplier – 1;
(f) Hill shape multiplier – 1;
(g) Lee zone multiplier – 1 (to a maximum of 1.35).

All JUSP, JUMA, and mast arm poles with curved outreach arms shall have a 10 degree tilt. In addition, poles and arms shall comply with all dimensions shown in Appendix A. The minimum spigot diameter on JUSP and JUMA poles shall be 42 mm outside diameter (OD). In the case of the JUMA and JUSP poles, the street lighting luminaire fitted to the outreach arm shall not exceed 0.15 m² in sail area, and have a mass of no more than 15.0 kg. The tilt angle shall be detailed on the drawings.

All fixtures and fittings are detailed (traffic signals, pedestrian signals, street lights, signage, and any other fittings or fixtures required for the specific installation) along with the height at which their weight and windage is to be calculated as a minimum. Drag coefficients are to be in accordance with Table E4 of AS/NZS 4676.

The JUSP pole door cavity/fuse opening shall be of a suitable weatherproof design and shall be positioned to permit safe access for maintenance (not facing the street/traffic lane). The ideal position would be to allow the technician to view oncoming traffic. The cover plate shall be secured by a minimum of two child and vandal resistant 304 grade stainless steel fasteners and will require a specialised tool to remove the fasteners for maintenance.

In the case of octagonal JUSP poles, the door cavity/fuse opening shall be a standard size of 300 mm x 140 mm and be positioned 600 mm (to the base of the opening) above the finished ground level. In the case of the JUMA pole, the door cavity/fuse opening for the
street light isolation shall be a standard size of 180 mm x 80 mm and be positioned just below the mounting flange for the street light outreach arm.

All steel tube used for manufacture of the 5.1 m traffic light poles shall be a minimum of 100 nb (nominal bore) CHS (Circular Hollow Section) to C250LO in accordance with AS/NZS 1163.

Pole strengths are based on NZS 3404. Steel section strength requirements apply to the base of the pole at the top of the concrete footing.

All welding shall be carried out in accordance with AS/NZS 1554.1, with welders qualified to AS/NZS 2980. Inspection certificates by a duly qualified independent inspection company are to be supplied for each batch manufactured.

2.5.1.1 Pole identification

Poles shall be permanently marked (prior to painting) by way of indentation stamp to indicate date of manufacture (dd/mm/yyyy) and the name of the manufacturer. This indentation stamp shall be located immediately under the lower pedestrian mounting lug. Arms are to be identified in the same manner with the location being on the outer surface, immediately above where the arm connects to the pole. The indentation stamp letter and number size is to be of a size suitable to be easily identified. Lettering shall have a minimum height of 7 mm and a maximum height of 14 mm. All marking is to be applied prior to painting.

2.5.1.2 Pole Finish

All JUMA, JUSP, and mast arm poles and arms shall be finished, both internally and externally, in accordance with AS/NZS 4680. Ready galvanised steel, spray on galvanising or thermal zinc will not be accepted. In addition, pole coatings shall be in accordance with AS/NZS 2312 with certification to Category D for a 10-year warranty to first maintenance.

2.5.1.3 Pole Installation

Each pole type will require a PSI certificate to be issued by a suitably qualified Chartered Professional Engineer. This certificate shall include the specific design details for both the pole and, when requested, the foundation details, and will be supplied at time of tender.

Mounting of the poles are of two possible types – ground planted and concrete pad.

Ground planted poles are an extension of the pole below the finished ground surface. The length below ground will vary depending on the model of pole being installed and ground conditions in the location. The minimum soil bearing capacity should be 100 kPa. A site specific foundation design will be required for any capacity less than 100 kPa.

Concrete pad mounted poles will typically be of a flange based type. These poles will require a concrete pad or pile to be constructed that will include during pouring the use of a suitable holding down bolt cage. Pads and piles are typically used in locations where the ground conditions are not stable enough to maintain overturning resistance.

2.5.2 Pole terminal assemblies

2.5.2.1 Switch terminations (terminal assemblies)

The terminal assembly shall consist of sufficient 2.5 mm 2-in-2-out knife edge disconnect terminals for the number of cores to be terminated. The terminals shall be spring loaded screw locked incorporating a screw and spring tensioned system or have a minimum of one screw per cable core. The neutral and earth terminals shall be double through terminals to facilitate a greater number of terminations. The terminals shall be mounted on
aluminium rails and end clamps shall be provided at each end of the rail. Each terminal shall be clearly labelled.

2.5.2.2 Neutral terminations
The terminals shall meet the requirements of 2.5.1.1, except that they shall not use switch terminations.

2.5.2.3 Earth terminations
The earth bus bar shall provide ten outputs with connectable cross-sections measuring 10 mm$^2$ and 16 mm$^2$ configured alternately. The bar shall be rail mounted and have a rated voltage of 450 V and be rated IP20. The insulating material shall meet IEC 60998 Part 1 and Part 2-1.

2.5.2.4 Five metre pole termination (terminal assembly unit)
The top of each standard 5 m pole shall be fitted with a terminal assembly unit and cover meeting the requirements as shown in Appendix B.

The pole top and full Upper Mounting Bracket (UMB) shall be a combined unit, complete with cable terminal and lantern lead supports, and a finial cap capable of being fastened into position so that it cannot be removed if the securing bolts are loose.

The finial cap shall be made of plastic and constructed to fit snugly over the pole top to minimise the ingress of dirt and grime. The finial cap shall be secured to the UMB by a wire lanyard to prevent it from blowing away if not fastened correctly. Do not use metal finial caps.

All nuts, washers, bolts, and fasteners shall be galvanised, and the pole top/mounting bracket shall be constructed in a non-corrosive material.

2.5.2.5 Mast arm pole termination
All mast arm poles shall have a terminal assembly box (montrose box) mounted no lower than 3.5 m from the adjacent ground level.

The box shall be constructed from aluminium or polycarbonate with minimum dimensions of 400 mm x 350 mm x 120 mm rated to IP65. It shall be bolted to the pole and shall include a rubber seal or gland between the box and the pole metalwork to create a waterproof seal. The lantern leads shall enter through the underside of the box. Any cables entering through the back of the box shall be held by a compression gland. No holes will be permitted in the box that will allow condensation or moisture to enter.

All cables shall be terminated in accordance with the details shown on the cable termination chart (see Appendix F for example).

2.6 Pedestrian and cycle detection

2.6.1 Pedestrian push button assemblies
Pedestrian push-button assemblies shall contain audio and tactile facilities and shall comply with AS 2353.

In addition, the following requirements shall be met:

(a) The call box shall provide an audible locating and ‘WALK’ signal;
(b) The audible locator shall incorporate ambient noise control;
(c) The tactile function shall be continually operational; however the audio signal should be able to be muted.

2.6.2 In ground or above ground pedestrian detection
All in ground (IGD), above ground (AGD), and related equipment shall be approved by the RCA Traffic Signal Engineer before installation.
2.6.2.1 In ground pedestrian detection
In-ground pedestrian detection systems are no longer accepted as the means for pedestrian detection at new installations.

2.6.2.2 Above ground pedestrian detection
All AGD units shall be located such that they are able to cover the required area of detection and shall be compatible with the traffic signal controller detection and operation.

2.6.3 Cycle push-button assemblies
Cycle push-button assemblies shall be the same as the pedestrian push-button assemblies except that:

(a) They shall be coloured blue;
(b) The audio and tactile facilities are not required;
(c) The embossed arrow disc shall be replaced with a red lens similar to a vehicle signal lens, and embossed with the cycle symbol;
(d) They shall incorporate a visual call accept signal.

An example of cycle push-buttons can be found in Appendix M.

2.7 Inductive loop detectors (vehicle and cycle)
Inductive loop detectors may be either preformed or saw cut on site.

Where preformed loops are to be installed they shall have site specific approval of the RCA Traffic Signal Engineer. Each preformed loop shall be constructed to meet the dimensions and lane offsets as in the diagram in Appendix C.

Where non-inductive detection technology is to be used (such as camera technology) it shall have site-specific approval of the RCA Traffic Signal Engineer.

2.8 Testing of equipment
All signal equipment supplied or installed, including the signal controller, load switching equipment, cable terminals, plugs, and so on, is to be fully tested under simulated working conditions before being installed on site.

For acceptance and testing during installation, see Section 3.15.
3 INSTALLATION AND COMMISSIONING OF TRAFFIC SIGNAL EQUIPMENT

3.1 General
Section 3 sets out the requirements for the installation and commissioning of signal equipment including the controller, cabinet, vehicle and pedestrian signals, call boxes, detection equipment, and detector loops. It also addresses the painting of equipment.

The contractor warrants that:
• The equipment has been/will be installed in accordance with the manufacturer’s instructions, all applicable laws and standards, and the reasonable instructions of the RCA,
• The equipment will not malfunction for a minimum period of as defined in Section 2.2.2, from the date of commissioning.

3.2 Temporary traffic management
The contractor shall be responsible for the supply and erection of all necessary barricades, warning notices, lights, and so on, as required under 5.7.2 of NZS 3910 and the Transit New Zealand Code of Practice for Temporary Traffic Management, or any other specific documents that may be provided by the RCA or client.

The contractor shall obtain from the RCA whatever approvals are required to be able to work on the roadway under the RCA’s control.

3.3 Supply of electric power
The contractor shall be responsible for arranging, with the RCA’s power supply company, the provision of a power meter and the switching on of power to the signal control cabinet. The contractor shall pay all costs (including fees) associated with this work, obtain all necessary permits, and shall provide the certificate of compliance to the engineer on completion of the works.*Please note these costs can be variable, and need to be addressed by the primary contractor.

3.4 Waterproofing
All equipment below ground level shall be constructed and treated to permit continuous operation without fault due to immersion in ground water or other corrosive agents commonly encountered on or beneath roads.

3.5 Electrical wiring
All electrical work shall be completed in accordance with AS/NZS 3000.

3.5.1 Pole top cable terminations
All cables shall be brought up the interior of the signal pole or mast arm, and terminated on the specified terminal assemblies. All cables shall be firmly supported at the point of termination in such a manner that the weight of the cable shall not impose mechanical strain on the electrical connections.

The cores of each cable are consecutively numbered on the core insulation and each core shall be terminated into the terminal labelled with the same number.

Where a 36 core cable is not used (generally in existing installations), and there is more than one cable coming into a pole, then the largest cored cable or cable labelled ‘A’ (see Section 4.8) shall start at terminal 1 with the smaller cables following on. For example, with a 25 plus a 12 core cable, core 1 of the 25 core will be terminated into terminal 1 with core 1 of the 12 core terminating into terminal 26. It is not necessary to label each core since core 6, for example, will always terminate into terminal 6.

The cable sheath shall be removed for an adequate length with due precautions being taken not to damage the insulation of the individual cores. The cable cores shall be neatly formed
and laced to allow individual conductors to be connected to the appropriate numbered terminal in accordance with the approved cable termination chart (see Appendix F for example). The cores of different cables shall not be laced together.

The bunching and tying of cores shall be arranged such that all terminal labelling remains visible, and individual cores may be conveniently disconnected from any terminal for subsequent maintenance. All cable cores, including spares, shall be allocated terminals, and shall be terminated within the pole top.

3.5.2 Earthing (bonding)
All metal components shall be individually earthed in accordance with AS/NZS 3000, using a minimum size earthing cable of 4.0 mm². Particular attention should be given to poles (including mast arms), callboxes, finial caps, metal bodied signals, unused cable cores, controller and cabinet, mast arm termination box, and audio tactile driver box. All unused cable cores shall be bonded to earth in the controller cabinet.

3.5.3 Cable termination chart
For all new installations, a cable termination chart (see Appendix F for example) shall be completed prior to termination of cables onsite and supplied to the RCA Traffic Signal Engineer.

At existing sites, the contractor shall amend the existing cable termination chart supplied by the RCA. If no cable termination chart exists, the contractor shall be required to produce one from existing cable documentation as appropriate.

All cabling, both at the controller cabinet and at the pole, shall comply with the details of the cable termination chart.

3.6 Controller cabinet
The controller cabinet shall be securely fixed to a concrete foundation or preformed base with, at minimum, four hot dipped galvanised bolts (minimum size M12) such that the cabinet is aligned true to the vertical and cannot be rocked from side to side. Where a standard preformed base is not to be used, the foundation details shall be supplied to the RCA Traffic Signal Engineer for approval.

Where the cabinet is not surrounded by concrete or asphalt, a 300 mm wide concrete apron shall be provided around the base of the controller. The apron shall be 100 mm thick and be widened to 900 mm on the side adjacent to the door. The apron shall be installed to provide drainage away from the controller to the adjacent ground and to maintain a comfortable working platform.

3.7 Controller terminations
All cables entering the controller cabinet shall be securely supported at their outer sheath to ensure that no mechanical strain is transmitted to the electrical connections. The individual cores shall be neatly formed and tied, and positioned such that access to housing terminals is not obstructed and terminal designations are not obscured. Each cable shall be individually labelled in accordance with its designation as shown on the approved cable termination chart.

All field wiring terminals in the controller cabinet shall be vertically mounted with sufficient terminals to cater for the maximum number of signal group outputs within the logic rack. Each signal group (both pedestrian and vehicle groups) shall be provided with three terminal groups. Each group shall consist of two 2-in/2-out spring loaded screw locked terminals designed for 2.5 mm² cable.

Terminal separation plates shall be used between each signal group and end clamps shall be used at each end of the rail.

An additional non-switched terminal unit shall be used and located on the left-hand side of the gear plate. This unit shall include three terminal blocks for both earth and neutral, plus
one separate terminal block for general purpose (GP) phase (wired through the GP circuit breaker), detector returns, pedestrian buttons, special inputs and outputs, and so on.

The terminals shall be grouped together with the earth and neutral at the bottom, then any 230 V supplies and then the low voltage supplies at the top. A terminal separation plate shall be used between the earth and neutral terminals and between the 230 V and low voltage terminals.

Each terminal shall be clearly labelled with its function using labels supplied by the terminal manufacturer. There shall be a schematic wiring diagram provided within the controller (generally on the inside of the controller door) it shall provide a true representation of the physical on site wiring configuration.

3.8 External vehicle loop detector units
For all new signal installations, the detector units shall be located in the controller cabinet.

In special cases, or where an existing installation is involved, detector equipment may have to be accommodated in the weatherproof boxes attached to the signal pole nearest to the loop. Attachment of detector units to poles on medians or small islands shall be avoided as far as practicable. Pole-mounted detector units shall be mounted in an unobtrusive manner so that convenient access can be obtained to them from a ladder placed on the footpath.

The power supply for all detectors that are mounted external to the controller shall be taken from the output side of the lamp isolation relay.

The connection of the loop feeder cable to the detector rack shall be carried out through terminals to allow easy isolation of the loop/loop feeder side of the circuit for testing purposes. The terminals shall be suitable for low voltage and therefore standard disconnect terminals are not appropriate. The terminals should preferably be mounted vertically down the left-hand side of the gear plate. The terminal rail shall be long enough to mount sufficient terminals for 24 detectors.

The terminals shall be labelled with the on-street detector number.

The loop feeder shall be securely clamped with clamping bars to the gear plate so that no strain is placed on the core conductor.

3.9 Pole (post) locations and installation
All poles shall be sited in accordance with the approved design drawing with the appropriate clearances.

Prior to installation, the pole locations shall be marked on site and their locations approved by the RCA Traffic Signal Engineer.

Poles are to be positioned to ensure that no part of the signal lantern or backing board is closer than 300 mm to the face of the kerb.

Where not surrounded by concrete or asphalt, the pole shall have a 500 mm², 150 mm deep, 20 Mpa concrete surround. The concrete surround shall be sufficient in width to ensure that the ducting finishes within the area of the concrete, in order to protect all cabling. (See Appendix D.)

3.10 Signal lanterns

3.10.1 Lantern mounting supports, brackets and straps
All lantern mounting brackets, bolts, nuts, and mounting hardware shall comply with Section 3 of AS2339:1997.
All lower lantern nut and bolt assemblies shall be installed complete with a locking mechanism as detailed in 3.2.3 of AS2339:1997. One such acceptable method is to comply with the locking mechanism as detailed in Appendix N. Where more than a single column of lanterns are installed on one strap back to the pole, each end of the strap must have a locking mechanism fitted.

Each vehicle/pedestrian lantern group shall be mounted individually.

All signals attached to pole top assemblies shall have their leads securely fixed to the assembly using clamping bolts, nuts, and washers or studs not less than 10 mm in diameter.

Each signal lantern shall be attached to its mounting brackets by galvanised steel mounting straps of sufficient length to permit the lantern to be adjusted laterally to provide an adequate signal indication and vertically to conform to the approach gradient. Straps shall comply with Table 1.

Table 1 – Lantern mounting strap dimensions

<table>
<thead>
<tr>
<th>Strap length (mm)</th>
<th>Strap thickness (mm min)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Up to 150</td>
<td>3</td>
</tr>
<tr>
<td>151 to 250</td>
<td>5</td>
</tr>
<tr>
<td>251 to 400</td>
<td>6</td>
</tr>
</tbody>
</table>

Straps shall be in a continuous length without joints, and one strap shall not be hung off another strap.

3.10.2 Lantern leads
The lantern leads shall:

(a) Be covered with a continuous 15 mm flexible hose from their exit point from the lantern to the clamping point on the UMB;

(b) The pole-connecting end of the hose shall be prepared so as to enable it to be firmly clamped in a recess in the pole top assembly without undue distortion or crushing of the hose;

(c) When hanging freely, the lantern lead shall extend down to approximately the halfway point of the lantern.

3.10.3 Siting of signal lanterns

3.10.3.1 Siting and alignment
Each lantern shall be sited and aligned in accordance with Austroads publication Guide to Traffic Engineering Management Part 10 – Traffic Control and Communication Devices.

3.10.3.2 Lantern mounting height
Except where the tertiary or secondary lanterns are mounted within 10 m of the vehicle limit line, all vehicle lanterns shall have a mounting height of 4.1 m, measured to the top mounting bracket of lantern.

Where low level tertiary or secondary signal lanterns are located within 10 m from the vehicle stop line, the mounting height shall be 3.1 m, measured to the top of the mounting bracket of the lantern.

The minimum clearance from ground level to the bottom of a target board for signals restricted by an overhead obstruction is to be 2 m.
The minimum clearance from the road surface to the bottom of the target board for overhead lanterns is to be 5.3 m. The maximum clearance is to be 5.8 m.

Where the position of the signal poles as installed does not allow the recommended positioning or appropriate visibility to be achieved, the contractor shall notify the RCA Traffic Signal Engineer before installing the lantern.

### 3.10.4 Covering of lanterns

Immediately following installation and during periods when the lanterns are not in use they shall be securely covered to completely obscure them while being installed or when not in use.

The lanterns shall be covered using a shroud as detailed in Appendix E.

Where commissioning will take place within one day of lantern installation, the engineer may allow a dispensation from this requirement but otherwise shrouding shall be necessary for the full period from installation until commissioning.

### 3.11 Inductive loops

Inductive loops shall be positioned to record the specified output from vehicles passing or occupying the positions indicated on the appropriate plans and to the dimensions and locations shown in Appendix C.

The contractor shall mark the required position of the inductive loop on the ground and inspect the road surface to ensure that the site conditions, including seal conditions and roadway integrity, will in no way reduce the operational performance of the detection equipment. If the contractor considers that the conditions are not satisfactory, they shall notify the RCA Traffic Signal Engineer before installing the detector loops. The contractor shall notify the engineer prior to closing the traffic lanes for the purpose of installing the loops so that the engineer may attend the site to carry out the installation inspections that they consider appropriate.

The inductive loop wire shall consist of single core polypropylene insulated cable with a nominal cross-sectional area of $1.5 \text{ mm}^2$ complying with AS/NZS 2276.3.

The cable shall be laid in one continuous unjointed length, laying it twice around each loop as shown in Appendix C. Tails for up to two loops may be laid in the same slot if required.

In general, the detector loop wire shall be installed in a saw cut slot that is approximately 5 mm wide and 40 mm deep to provide a minimum top cover to the wire of 12 mm. All saw cuts shall be straight and shall extend past the loop corners to ensure the full depth of cut throughout. Prior to placing the loop wire, the slot shall be dried and cleaned and free of debris to provide a smooth bed for the wire. The recommended method of doing this is with compressed air.

When re-cutting loops the new saw cut shall be at least 300 mm away from the old saw cut to minimise road surface damage. If the saw cut for the loop tails is to go through the kerb, then it should go through an existing mortar joint to minimise unsightly appearances.

The loop wire shall be ‘rolled’ into the slot without damaging the insulation. This can be achieved using a thin disc such as a modified saw blade but not a screwdriver. Special care shall be taken at the corners to ensure the wire is curved rather than bent. Each loop shall be wired as shown in Appendix C.

Immediately following the installation of the loop wire, and prior to sealing, an insulation resistance test shall be performed. The loop should have a resistance to earth of not less than 10 mega-ohms. Sealing shall be done immediately following the completion of the loop insulation test.
The loop wire slot shall be sealed with an approved flexible epoxy sealant, ensuring a continuous seal over the complete length of the loop and loop tails. The sealant shall be finished flush to the road surface.

Where the loop tail is cut through the kerb and channel the tails shall be inserted in a 5 mm wide saw cut made with a minimum 450 mm diameter blade. The saw cut kerb and channel shall be sealed with a sand cement mortar.

Due to noise and traffic flow conditions, the RCA or client may restrict the time at which detector loops may be installed.

3.11.1 Loop testing
All loops shall be tested by measuring the insulation to ground (earth) and the results recorded on the commissioning sheet. The test shall be taken at 250 V conductors to earth and a result of not less than 10 megohms will be acceptable.

3.11.2 Saw cutting
The contractor shall ensure that no solid matter enters any waterway as a result of the saw cutting operation. This could require the placement of filters, or similar, on catchpits, and so on.

On completion of the installation the contractor shall ensure that the surrounding area is swept clean of all sand and debris. This material shall be suitably disposed of.

Preformed loops shall be installed according to the manufacturer’s details and retain the correct shape and dimensions as shown on Appendix C when installed.

3.11.3 Loop feeder connections
Where multi-pair feeder cable is used, the convention for terminating the loops shall be:

(a) Pair 1 connected to the kerbside detector loop;
(b) All remaining connections numbered consecutively from the kerb.

All unused pairs shall be sealed in a similar method to the loop connections.

The contractor shall make a clean, dry, waterproof electrical connection between the loop tails and the loop feeder wires. The connection shall be located within a kerb side junction box. The feeder cable sheathing shall be sealed to ensure that no water may enter into the cable.

3.12 Pedestrian and cycle push button assembly
The push button assembly shall be mounted so that the underside of the assembly is 900 mm above the pavement.

Unless specifically detailed, the pedestrian assembly shall be located in accordance with Section 5 of RTS 14, that is, so that the front of the assembly is perpendicular to the pedestrian crossing lines and so the arrow disc will always be orientated with the arrow pointing straight up.

On non-staggered medians, the assembly shall be oriented parallel to pedestrian lines ensuring that the arrow disc has the arrow pointing parallel to the ground.

The cycle assembly shall be located so that the front of the assembly is parallel with the kerb.

Wiring for the call-accept is required for cycle call boxes.

3.13 Painting and surface coating of equipment
All surface coatings shall carry a 10-year guarantee from their date of installation except where the degradation is caused by vandalism.
The contractor shall supply the RCA Traffic Signal Engineer with the paint manufacturers’
documentation specifying the maintenance requirements for surface-coated equipment.

All painting of signal poles and equipment shall be as in Table 2.

Table 2 – Painting and surface coating of equipment

<table>
<thead>
<tr>
<th>(A) GENERAL REQUIREMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>• All new poles shall be pre-coated prior to delivery on site</td>
</tr>
<tr>
<td>• All coatings shall be applied in strict accordance with the manufacturer’s recommendations</td>
</tr>
<tr>
<td>• No painting shall be carried out in wet, foggy, frosty, windy, or dusty weather</td>
</tr>
<tr>
<td>• The colour yellow described in this specification shall be colour number Y14 Golden Yellow as described in AS2700 (Altex Standard Factory Colour Golden Yellow is acceptable).</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>(B) PAINTING SCHEDULE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standard poles</td>
</tr>
<tr>
<td>Overhead and joint use poles</td>
</tr>
<tr>
<td>Lanterns:</td>
</tr>
<tr>
<td>Signal face</td>
</tr>
<tr>
<td>Signal housing</td>
</tr>
<tr>
<td>Target boards</td>
</tr>
<tr>
<td>Signal visors</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Illuminated signs:</td>
</tr>
<tr>
<td>Sign face</td>
</tr>
<tr>
<td>Sign housing</td>
</tr>
<tr>
<td>Sign visors</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Pedestrian call boxes</td>
</tr>
<tr>
<td>Cycle call boxes</td>
</tr>
<tr>
<td>Other items (such as pole caps, detector boxes)</td>
</tr>
</tbody>
</table>

3.14 Special tools and keys
The contractor shall supply to the RCA Traffic Signal Engineer one set of any special tools necessary to efficiently adjust and operate the equipment. This equipment will not be required if previously supplied to the RCA. The controller key type will be an FS880 or as specified in the local RCA’s regional amendments.

3.15 Acceptance and testing
On completion of the work, the equipment is to be left clean, free from dirt, dust, and paint blemishes. All services, equipment, and fittings shall be in proper working order and in good condition in accordance with this specification.
3.15.1 Pre-commissioning tests
When the contractor has satisfied all of the requirements of the power supply authority, and considers that any particular part of the contract is ready for commissioning, the pre-commissioning checks as set out in the site acceptance sheet in Appendix G shall be performed in the presence of the RCA Traffic Signal Engineer or their representative.

The contractor shall also provide an electrical certificate of compliance to the engineer prior to the pre-commissioning check.

3.15.2 Earthing and earth impedance test
The contractor is to undertake an earth impedance test to AS/NZS 3000 and submit results in a report as part of their pre-commissioning checks. The tests shall include the following:

(a) Earth resistance test-continuity of main earth conductor;
(b) Insulation resistance test for insulation;
(c) Earth resistance test for other earthed and equipotential bonded parts;
(d) Consumer’s main test – polarity and connections;
(e) Final sub-circuit test – polarity and connections;
(f) Earth fault loop impedance test; and
(g) Verification of residual current devices (if fitted).

3.15.3 Software (personality) controller bench test
The contractor shall be required to confirm for themselves that the controller software (personality) has been programmed to operate in a safe manner and to the requirements of the design drawings and controller information sheet (CIS). If the contractor is of the opinion that the software is not operating correctly or safely, or there are discrepancies between the design drawings and the CIS, then they shall immediately inform the engineer.

The traffic signal contractor shall complete a FULL bench testing of the controller software (personality) at least 1 week prior to the proposed commissioning date of the signal installation or intersection upgrade.

All bench testing shall be based on the operation as specified in the latest revision of the CIS, signal design drawing, and controller software (SFT) file.

The bench testing shall be undertaken using a similar controller operating under the same version of the background (TRAFF) software as will be installed in the controller on site.

The bench testing shall include but not be limited to:

(a) Confirmation that all detectors call and extend the relevant phases;
(b) Confirmation that the correct signal displays/output groups are activated in the relevant phases;
(c) Confirmation that each signal group output has been configured as either a Major, Minor, or Pedestrian output in accordance with the CIS;
(d) Confirmation that all conflicting signal group outputs (both pedestrian and vehicle) cause the controller to go into fault mode by physically inducing conflicting outputs. The contractor shall be required to confirm that the conflict matrix detailed in the CIS is correct and that the conflict matrix programmed into the controller personality is the same as that shown in the CIS;
(e) Confirmation that all time settings are consistent between the software and the CIS;
(f) Confirmation that the controller will operate under Flexilink mode of control;
(g) Confirmation that any special logic requirements work as specified; and
(h) Confirmation that any special facility flags (such as Z-, Z+, and any XSF bits) operate as specified.

The contractor installing the software shall submit completed and signed forms 5 working days prior to commissioning the site verifying that the traffic signal controller personality has been FULLY bench tested. A copy of the controller bench testing form is in Appendix H.
The contractor shall notify the RCA Traffic Signal Engineer at least 24 hours prior to the bench testing being undertaken so that the RCA Traffic Signal Engineer may be present when the testing is being completed.

3.15.4 Commissioning

When the RCA Traffic Signal Engineer or their representative is satisfied that the signals are installed and operating in accordance with this specification, they will direct and supervise the commissioning of the signals.

The contractor shall notify the RCA Traffic Signal Engineer 48 hours prior to commissioning the installation. Commissioning shall occur outside of the peak traffic periods at a time specified by the engineer. No commissioning shall take place on a Friday or the day before a public holiday.

Unless approved by the RCA Traffic Signal Engineer, commissioning will not be allowed until the controller has been installed on site, and has had continuous SCATS communications for at least 48 hours.

An example of a commissioning check sheet for a new installation is in Appendix J.

3.16 As-built documentation to be provided

The contractor shall also supply in both electronic and hardcopy the following within 4 weeks of commissioning:

(a) As-built plan showing the final locations of all poles, access chambers, KJB, loops, lantern displays, and cabinets if they are different from the construction drawing;
(b) A completed cable termination chart (in spreadsheet format). A typical layout is shown in Appendix F;
(c) A completed traffic signal asset collection form (see Appendix K) for RAMM;
(d) Results of all earth loop impedance testing carried out on all traffic signal poles and cabinets shall be supplied to the RCA’s engineer prior to commissioning (appendix M). The results shall be signed by the technician who carried out the testing;
(e) A log book. The log book shall be completed every time anyone attends site, and shall detail the reason for attending site and a brief description of the work carried out. Each entry shall be dated and signed; and
(f) A copy of the electrical certificate of compliance.

At the time of commissioning, a copy of items (a) and (b) shall be provided in the controller cabinet along with a log book and a copy of the CIS. Within 2 weeks of commissioning, a laminated copy of (a), (b), and the CIS sheet shall be inserted into the document pocket inside the controller cabinet.

3.17 Procedure for turning off signals

Where it is necessary to switch a controller either off, to flashing yellow, to take the site off-line, or to switch the signal displays off, notice shall be given to the appropriate RCA. The RCA shall be notified immediately prior to such action being taken and immediately after the controller and communications are fully operational again. The fact that the signals were turned off shall be recorded in the control cabinet log book.

When a signalised intersection is planned to be turned off, or switched to flashing yellow, for more than ten minutes, the contractor shall ensure that the RCA’s engineer is informed so that arrangements for alternative control of the intersection can be made as necessary. Once the RCA Traffic Signal Engineer has been notified, the contractor can proceed with turning off the signals, unless specifically requested to wait for further assistance.

When a signalised intersection is planned to be turned off (not flashing yellow) for more than 10 minutes, the contractor shall adhere to an approved traffic management plan (TMP).

At no time during planned works shall an intersection be left unattended with the signals off unless an approved TMP is in place. Also, at no time shall any warning signs or shrouds
that indicate that the signals are not in operation be in place on any street or road when the signals are working.

When there is an unplanned outage of a signalised intersection (such as the result of a controller fault or accident), the contractor shall immediately assess the problem and where necessary make the site electrically safe. If the signals can then be repaired and made operational (either fully or at least flashing yellow) within 1 hour, and can be done so safely and without the need to work in a live lane, then the contractor is to proceed immediately with the repairs using a previously approved TMP that relates to the particular type and location of the work. Refer to RCA’s regional amendments to P43 if operational repairs will take longer than 1 hour, or where work needs to occur within a live lane.

It should always be the intention of the contractor to arrange the work so that the signals will be switched off or set to flashing yellow for the shortest possible time. This will mean that wherever possible, work on the signals is to be continuous until they are switched back to normal control. If a site is under approved temporary traffic management (as set out in an approved TMP), then it will normally be acceptable to turn the signals back on with a reduced number of signal displays. Assuming good visibility of lanterns, the minimum number of displays on any approach can be:

(a) Primary or dual primary plus secondary; or
(b) Primary or dual primary plus tertiary.

The intention to operate the signals with reduced displays shall be highlighted in the TMP, which should detail each approach where displays will be reduced. The RCA’s regional amendments to P43 may set out additional requirements.
4 CABLING AND CIVIL WORKS

4.1 General
Section 4 sets out the requirements for the supply and installation of all cabling including multicore cable, loop feeder cable, ducting, trenching, and backfilling. It also addresses the installation of kerbside junction boxes, poles, and the controller base.

4.2 Cable diagram
Cable sizes and approximate duct positions can be found on the schematic cable diagram on the signal drawing but the contractor should confirm that the cabling and ducting shown is adequate for the signals equipment depicted on the same drawing.

4.3 Trenching
All trenching and restoration work shall be in accordance with the RCA’s specification. A detailed TMP shall be approved before work commences.

Open cut trenching across carriageways shall be carried out only between the hours approved by the engineer.

4.4 Cabling, ducting, and signal duct access chambers

4.4.1 Ducting
Ducting shall be installed from the controller to all signal duct access chambers, between chambers, and from the chamber to the signal pole in the locations indicated on the drawings.

The duct lines shall link all chambers in a complete ring to facilitate multiple cable run options.

The preferred method of installing the duct lines is by underground thrusting.

In open cut trenching, ducting for all multi-core cables shall use 100 mm diameter orange PVC electrical burial-grade conduit, and shall be continuous between access chambers and from access chamber to within 300 mm of the base of each pole. The ducts shall be placed no less than 600 mm and no more than 1000 mm below finished ground level.

All thrusted ducting shall be continuous without any joints and shall comply with the Electricity (Safety) Regulations.

The minimum number of ducts from the controller and between access chambers is two (2).

All ducting is to be installed complete with draw wires to facilitate pulling through of cables. The draw wire will remain in place on completion of cabling for future use and must always be replaced when used.

Ducting for loop feeder cables shall be a minimum 50 mm diameter orange PVC electrical burial-grade conduit laid to a depth of not less than 300 mm and where provided directly behind the kerb. It shall be continuous between the KJB and the closest access chamber.

Where ducting pipes need to be joined, they shall be jointed with approved PVC cement.

Communications ducting should comply with the local RCA’s requirements.

4.4.1.1 Pole access ducting
Access from the ducting to the signal pole shall be as shown in Appendix D.
4.4.2 Signal duct access chambers
Signal duct access chambers are to be provided at all 230 V cable duct intersection points and at either end of sub-carriageway ducting as shown on the signal drawing. Where possible, chambers are to be at least 2 m clear of the carriageway and clear of all pedestrian paths. A chamber is also to be provided immediately adjacent to the controller base.

Chambers are not to be located along pedestrian desire lines.

All duct access chambers shall be concrete and manufactured in accordance with NZS 3109 and AS/NZS 4058, with surfaces finishes to NZS 3114, and Class B cover as defined in AS 3996. Where contractors have chambers manufactured from alternative materials, they shall seek prior written approval from the RCA Traffic Signal Engineer before tender/installation.

All ducting shall be cut back to the chamber wall and shall be sealed by applying a sand cement mortar.

Where the chamber is installed in a grassed berm, the lid of the chamber shall be encased by a concrete surround, a minimum of 300 mm wide by 100 mm deep and using 25 MPa concrete.

4.4.3 Power cable
All cable shall be installed in the appropriate ducting as specified in Section 4.4.

The multicore cable shall be a purpose designed traffic signal cable externally insulated with orange sheathing with the internal individual core insulation being PVC coloured as described below. The external sheathing shall be marked to indicate its use in the installation of traffic signals. The cable shall comply with AS/NZS 2276.1 except as amended in Section 4.4.3.1.

The cable shall be in a continuous length from the controller to the pole and from pole to pole. Joints between poles will not be accepted in new works. A minimum of 2.0 m of cable slack shall be left at the controller base and a minimum of 1m in the chambers on all cable runs.

At existing installations where cable is to be replaced, similar cabling and cores as are already installed may be used.

Cabling shall not be installed into the ducting until backfilling of trenches has been completed.

4.4.3.1 Amendments to AS/NZS 2276.1
The following amendments shall be made to AS/NZS 2276.1:

(a) Remove requirement for external sheathing to be PVC. The sheathing used shall be suitable to be used in submerged conditions;
(b) Cable core requirements and colours
   (i) 27 1.5 mm² cores coloured white and consecutively numbered from 1 to 27 for signal group displays;
   (ii) 4 1.5 mm² cores coloured violet, labelled ‘ELV ONLY’ and consecutively numbered p1, p2, p3, p4;
   (iii) 1 2.5 mm² core coloured black;
   (iv) 1 4 mm² core coloured green/yellow for earth;
   (v) 1 red 1.5 mm² core as a general 230 V phase (for audio tactile, illuminated signs, cameras, and so on);
   (vi) 1 grey 1.5 mm² core detector return for push buttons;
   (vii) 1 orange 1.5 mm² core used for street lighting feed.
4.4.4 Loop feeder cable

The feeder cable shall be a twisted pair and be terminated on the appropriate field terminals.

The maximum number of pairs per cable is four (4). If multi-pair cable is used then each pair should be labelled with factory indelible numbering on the cores, or colour coded as detailed below:

Pair 1 - Blue and white/Blue
Pair 2 - Orange and white/orange
Pair 3 - Green and white/Green
Pair 4 - Black and white/Black

Cable pairs must be individually shielded.

All spare pairs are to be separated away from active pairs and all shield braids shall be connected to a common protective earth point.

The unshielded section of the feeder cable pairs shall remain twisted from the point they leave the cable shield to where they enter into the field terminals with the length of unshielded cable being as short as possible. All shields shall be connected to a single common functional earth point at the controller.

The feeder cable shall comply with AS/NZS 2276.2, except pairs shall be colour coded as above, and the overall external diameter will exceed 10mm. This is to allow the use of multi-pair loop-feeder cables.

At least 1.8 m of cable slack shall be left at the controller base with a minimum of 0.5 m curled up inside the kerbside junction box (KJB).

4.4.4.1 Loop feeder cable testing

All feeder cables shall be tested by measuring the insulation to ground (earth) and the results recorded on the commissioning sheet. The test shall be taken at 250 V conductors to earth and a result of not less than 50 megohms will be acceptable. The resistance of the feeder cable and connected loop, when measured at the controller, shall be no more than 10 ohms.

4.4.5 Mains power supply

The contractor shall be responsible for negotiating with the local electricity network provider for the supply of a mains power cable into the signal control cabinet.

4.4.6 Earthing

The earth pin and wiring connection shall be located in a protected enclosure not readily accessible to the public.

4.5 Installation of signal poles and mast arm/JUMA/JUSP poles

Signal poles shall be erected as detailed in Appendix A. Each pole is to be plumbed vertically to a tolerance of 10 mm per 5.0 m length.

For poles up to 5 m, all concrete footings shall have a 28-day compressive strength of at least 20 MPa. Footings for all other poles shall be as per the manufacturer’s pole foundation design requirements.

Signal poles shall be in locations shown on the signal plan. These locations are only indicative and final locations will need to be marked out and agreed to with the RCA Traffic Signal Engineer. The RCA Traffic Signal Engineer shall approve any changes to the designed pole positions.
For traffic signal installations on heavy haulage routes, any signal poles in central islands, or poles that restrict the width to below the heavy haulage route requirements, shall be fold down type as detailed in figure 5 in Appendix A.

The contractor shall confirm on site that the location of all poles meets the clearance requirements to existing electrical supply services, both underground and overhead, as set out in NZECP 34.

4.6 Controller base
The controller base shall be constructed to provide a solid non-rocking platform on which the controller may be placed.

The base shall be constructed using reinforced concrete with a 28-day compressive strength of 20 MPa.

The RCA Traffic Signal Engineer or their representative will mark the exact position of the base on site.

4.7 Kerbside junction boxes
Kerbside junction boxes (KJB) shall be constructed from plastic, cast, or sheet aluminium and shall be no smaller than 300 mm long by 200 mm wide by 150 mm deep.

The KJB shall be fitted with a firm fitting non-skid lid secured to the base and the lid shall lie flush with the top of the box.

Each KJB shall be installed at the locations indicated on the drawing. Where possible they should be located adjacent to the primary signal pole. The KJB shall be as close as possible to the back of the kerb and shall be level with the surrounding ground surface level.

Where there is no concrete kerbing present the KJB shall be located as close as practicable to the carriageway.

KJB shall be bedded on 100 mm of free draining material and surrounded by 150 mm wide by 150 mm deep concrete haunching and the junction box lid and haunching shall be flush with the surrounding ground level.

The junction box and installation shall be capable of withstanding being run-over by a heavy vehicle.

4.8 Labelling of cables
All multicore cabling shall be clearly labelled at both ends with the cable run number. The cable shall be numbered so that cable 1 goes to pole 1, cable 2 goes pole 2, and so on. When there are two or more identical cables laid between poles, one cable shall have its label followed by the letter A (for example, P6A) which shall have terminal numbers starting at 1. The second cable shall be labelled B (for example, P6B) and start at the next available terminal, and so on.

All loop feeder cable shall be labelled at both ends with the appropriate detector loop number.

The approved method for labelling all cables is using a heavy duty PVC marker, white with black moulded or engraved lettering. This marker is to be of the non-split type that completely encircles the cable core.

4.9 Cabling documentation
All new or modified traffic signal ducting and cabling is required to be recorded for inclusion on the appropriate RCA cable diagram.

Any contractor installing or modifying traffic signal ducts or cables shall notify the RCA Traffic Signal Engineer a minimum of 24 hours prior to backfilling any trenches in which
new or modified ducts/cabling have been installed so that the cables can be independently sighted and recorded. No inspections will be carried out outside of normal working hours except by prior arrangement with the RCA Traffic Signal Engineer.
5 MAINTENANCE OF NEW WORK DURING (DLP)

5.1 Fault attendance

All callouts to faults reported during the contract’s defects liability period (DLP), while the installation is under maintenance, or during the equipment guarantee period shall be attended by the installing contractor or their delegated sub-contractor.

While the installation is in the DLP, or similar periods, the contractor who installed the signals (installing contractor) shall be required to provide the contact details of a suitably qualified technician who is contactable 24 hours per day and 7 days per week to resolve faults. The response time to a priority 1 (emergency) fault by the installing contractor or their delegate will be no more than one hour. All other faults will have a response time of no more than 24 hours, Monday to Friday 0900 to 1700hrs.

The installing project will be responsible for ensuring that the contractor is suitably compensated for repairing any faults due to accident or vandalism during DLP. It is therefore in the project’s best interest to expedite project completion for the signals assets and therefore minimise their risk.

In the event that the RCA sends the maintenance contractor to attend to a fault, any costs incurred by the maintenance contractor for faults attended during the DLP will be reimbursed by the signals installation contractor.

At the end of the DLP/guarantee period, the equipment shall be handed over in full working order with no defects of any kind. Where defects exist, whether in control equipment, detectors, or signal hardware or in any part of the equipment supplied, these shall be made good at no cost to the RCA.

5.2 Preventative maintenance during DLP period

It will be the responsibility of the project to arrange any preventative maintenance during DLP. As a minimum, preventative maintenance should be undertaken by the installing contractor within a month of the scheduled handover to maintenance. Records of this maintenance will be provided to the RCA’s Traffic Signals Engineer at handover as evidence of the asset condition.
APPENDIX A – SIGNAL POLE DETAILS

Figure A01 – Type 0 Extension Signals Pole Ground Plant
Figure A02 – Type 1 NASSRA Pole Ground Plant
Figure A03 – Type 1 NASSRA Pole Retention Socket
Figure A04 – Type 2 150NB Combined CCTV Pole Ground Plant
Figure A05 – Type 2 100NB Combined CCTV Pole Retention Socket
Figure A06 – Type 3s & 5s JUMA Columns - Flange Mount
Figure A07 – Type 3, 5, & 7 JUMA Columns – Street Light Extension - Flange Mount
Figure A08 – Type 8 Hinged NASSRA Pole Ground Plant
Figure A09 – Type 8 Hinged NASSRA Pole - Retention Socket
Figure A10 – Type 9 Cycle Mastarm Columns - Flange Mount
Figure A11 – Type 10 Cycle JUMA with CBD Street Light Extension - Flange Mount
Figure A12 – Type 11 Cycle Single Pole with Cycle Rail - Retention Socket
Figure A13 – Octagonal JUSP Pole Ground Plant
Figure A14 – Octagonal JUSP Pole - Flange Mount
Figure A15 – CBD 9.0mtr 150NB JUSP Pole - Retention Socket
Figure A16 – Urban 150NB Pipe JUSP Pole - Retention Socket
Figure A17 – Some Pole Photos
REMovable POLE CAP
(MANUFACTURED BY SPUNLITE)

STRUCTURAL NOTES:
- MINIMUM ALLOWABLE SOIL BEARING PRESSURE SHALL BE 100 Kpa.
- CUSTOM TO PROVIDE ORIENTATION AND LOCATION.
- CONTRACTOR TO CHECK LOCATION OF ALL SERVICES BEFORE COMMENCING WORK.
- PROVIDE CONDUIT FOR CABLE ENTRY AS REQUIRED.

NOTE:
COLUMN TO BE COMPLETELY HOT DIP GALVANIZED.
FOUNDATIONS DESIGN INFORMATION IS SUPPLIED AS A GUIDE ONLY AND
MUST BE IN ACCORDANCE WITH THE COLUMNS PS1 AND GEOTECH REPORT.
ALL COLUMNS AVAILABLE WITH CYCLE RAIL ATTACHMENT BRACKETS.
CYCLE RAIL DESIGN DETAILED IN TYPE 11 DRAWING.

DESIGN PARAMETERS:
- DESIGN WORKING LIFE: 50 YEARS
- IMPORTANCE LEVEL: 2
- WIND REGION: 45 M/S
- TERRAIN HEIGHT MULTIPLIER: 2
- SHIELDING MULTIPLIER: 1
- HILL SHAPE MULTIPLIER: 1
- LEE ZONE MULTIPLIER: 1 (TO A MAXIMUM OF 1.35)

150NB PIPE
HOT DIP GALVANIZED
PAINTED IN AN APPROVED
10YR PAINT SYSTEM

4 x Ø 90° 150x100x10mm PLATE FOR
ANTI-ROTATION ON EACH SIDE OF POLE.
WELD TO POLE WITH 4mm FNAR

230mm x 60mm CUTOUT FOR CABLE
ENTRY (ONE SIDE ONLY).
GRIND EDGES SMOOTH.

- 600x 1450 DEEP CONCRETE
BASE (UNREINFORCED)

FOUNDATION DETAILS TO BE IN
ACCORDANCE WITH COLUMNS PS1
(Scale 1:40)

MOUNTING PLAN
(Scale 1:40)

PROJECT: NATIONAL TRAFFIC SPECIFICATION - GENERIC POLE DESIGNS
ADDRESS: NZTA P43 SPECIFICATION FOR TRAFFIC SIGNALS
TITLE: SPUNLITE TYPE 0 EXTENSION SIGNALS POLE -
GROUND PLANT

NZTA P43 SPECIFICATION FOR TRAFFIC SIGNALS City Council and State Law Policy Unit...
STRUCTURAL NOTES
- Minimum allowable soil bearing pressure shall be 100 Kpa.
- Client to provide orientation and location.
- Contractor to check location of all services before commencing work.
- Provide conduit for cable entry as required.

NOTE:
Columns to be completely hot dip galvanized.
Foundation design information is supplied as a guide only and
must be in accordance with the Columns PS1 and Geotech report.

All columns available with cycle rail attachment brackets.
Cycle rail design detailed in Type 11 drawing.

100NB Pipe
Hot dip galvanized
Painted in an approved
10yr paint system

Design Parameters:
- Design Working Life: 50 years
- Importance Level: 2
- Wind Region: 45 m/s
- Terrain / Height Multiplier: 2
- Shielding Multiplier: 1
- Hill Shape Multiplier: 1
- Lee Zone Multiplier: 1 (to a maximum of 1.35)

Typical Spunargo ground planted foundation

Mounting Plan
(Scale: 1:40)

Rev Amendment Description By C/k Date Design Parameters
A Initial issue DE - 07/15 Design Working Life: 50
- Importance Level: 2
- Wind Region: 45
- Terrain Category: 2

Project: National Traffic Specification - Generic Pole Designs
Address: NZTA P43 Specification for Traffic Signals
Title: Spunlite Type 1 Nassra Pole - Ground Plant

Org Size Scale Revision
A4 As Shown A
STRUCTURAL NOTES
- Minimum allowable soil bearing pressure shall be 100 Kpa.
- Client to provide orientation and location.
- Contractor to check location of all services before commencing work.
- Provide conduit for cable entry as required.

NOTE:
Columns to be completely hot dip galvanized.
Foundation design information is supplied as a guide only and must be in accordance with the columns PS1 and geotech report.

All columns available with cycle rail attachment brackets.
Cycle rail design detailed in type 11 drawing.

100NB PIPE
HOT DIP GALVANIZED
PAINTED IN AN APPROVED
10YR PAINT SYSTEM

DESIGN PARAMETERS:
- Design Working Life = 50 years
- Importance Level = 2
- Wind Region = 45 M/S
- Terrain/Height Multiplier = 2
- Shielding Multiplier = 1
- Hill Shape Multiplier = 1
- Lee Zone Multiplier = 1 (to a maximum of 1.35)

GROUND PLANT DETAILS TO BE IN ACCORDANCE WITH COLUMNS PS1

(Scale 1:30)
STRUCTURAL NOTES
- Minimum allowable soil bearing pressure shall be 100 kPa.
- Client to provide orientation and location.
- Contractor to check location of all services before commencing work.
- Provide conduit for cable entry as required.

NOTE:
Columns to be completely hot dip galvanized.
Foundation design information is supplied as a guide only and must be in accordance with the columns PS1 and geotech report.

All columns available with cycle rail attachment brackets.
Cycle rail design detailed in Type 11 drawing.

150NB PIPE
HOT DIP GALVANIZED
PAINTED IN AN APPROVED
10YR PAINT SYSTEM

4 x 90° 150x100x10mm plate for
anti-rotation on each side of pole.
Weld to pole with 4mm FWA.

230mm x 60mm cutout for cable
entry (one side only).
Grind edges smooth.

FOUNDER DETAILS TO BE IN
ACCORDANCE WITH COLUMNS PS1

DESIGN PARAMETERS:
- Design Working Life: 50 Years
- Importance Level: 2
- Wind Region: 45 M/s
- Terrain / Height Multiplier: 2
- Shielding Multiplier: 1
- Hill Shape Multiplier: 1
- Lee Zone Multiplier: 1 (to a maximum of 1.35)

MOUNTING PLAN
(Scale 1:40)

PROJECT: NATIONAL TRAFFIC SPECIFICATION - GENERIC POLE DESIGNS
ADDRESS: NZTA P43 SPECIFICATION FOR TRAFFIC SIGNALS

TITLE: SPUNLITE TYPE 2 COMBINED CCTV TRAFFIC POLE - 150NB PIPE POLE - GROUND PLANT

PROJECT NUMBER

ORG SIZE
A4

SCALE
AS SHOWN

REVISION
A
STRUCTURAL NOTES:
- Minimum allowable soil bearing pressure shall be 100 kPa.
- Client to provide orientation and location.
- Contractor to check location of all services before commencing work.
- Provide conduit for cable entry as required.

NOTE:
Columns to be completely hot dip galvanized.
Foundation design information is supplied as a guide only and
must be in accordance with the columns P51 and Geotech report.

All columns available with cycle rail attachment brackets.
Cycle rail design detailed in Type 11 drawing.
STRUCTURAL NOTES:
- Minimum allowable soil bearing pressure shall be 100 Kpa.
- Client to provide orientation and location.
- Contractor to check location of all services before commencing work.
- Provide conduit for cable entry as required.

NOTE:
Columns to be completely hot dip galvanized.
Foundation design information is supplied as a guide only and must be in accordance with the columns PS1 and EchoTech report.

DESIGN PARAMETERS:
- Design Working Life: 50 years
- Importance Level: 2
- Wind Region: 45 M/s
- Terrain / Height Multiplier: 2
- Shielding Multiplier: 1
- Hill Shape Multiplier: 1
- Lee Zone Multiplier: 1 (to a maximum of 1.35)

PLAN VIEW OF FLANGE BASE

HOLD DOWN BOLT CAGE AND NUTS TO BE SUPPLIED WITH COLUMN

PAD OR PILE FOUNDATIONS IN ACCORDANCE WITH COLUMNS PS1

Typical Flange Based Foundation

(Scale: 1:60)

MOUNTING PLAN

(Scale: 1:40)
STRUCTURAL NOTES
- Minimum allowable soil bearing pressure shall be 100 kPa.
- Client to provide orientation and location.
- Contractor to check location of all services before commencing work.
- Provide conduit for cable entry as required.
- Only approved light fittings may be used, no additional attachments can be placed on pole without Spunlite's approval (maximum light size = 0.15 m² with a CD = 1.0, maximum light weight = 15 kg)
- All dimensions shown are nominal.

NOTE:
Columns to be completely hot dip galvanized.
Foundation design information is supplied as a guide only and must be in accordance with the columns PS1 and Geotech report.

DESIGN PARAMETERS:
- Design working life: 50 years
- Importance level: 2
- Wind region: 45 m/s
- Terrain/height multiplier: 2
- Shielding multiplier: 1
- Hill shape multiplier: 1
- Lee zone multiplier: 1 (to a maximum of 1.35)

PLAN VIEW OF FLANGE BASE

HOLD DOWN BOLT CAGE AND NUTS TO BE SUPPLIED WITH COLUMN

PAD OR PILE FOUNDATIONS IN ACCORDANCE WITH COLUMNS PS1

TYPICAL FLANGE BASED FOUNDATION

MOUNTING PLAN
(Scale 1:40)

FINDATION DETAILS TO BE IN ACCORDANCE WITH COLUMNS PS1

(SCALE 1:60)
STRUCTURAL NOTES:
- Minimum allowable soil bearing pressure shall be 100 Kpa.
- Client to provide orientation and location.
- Contractor to check location of all services before commencing work.
- Provide conduit for cable entry as required.

NOTE:
Columns to be completely hot dip galvanized.
Foundation design information is supplied as a guide only and must be in accordance with the columns PS1 and Geotech report.

All columns available with cycle rail attachment brackets. Cycle rail design detailed in Type 11 drawing.

100NB Pipe
HOT DIP GALVANIZED
PAINTED IN AN APPROVED
10YR PAINT SYSTEM

DESIGN PARAMETERS:
- Design Working Life: 50 years
- Importance Level: 2
- Wind Region: 45 m/s
- Terrain / Height Multiplier: 2
- Shielding Multiplier: 1
- Hill Shape Multiplier: 1
- Lee Zone Multiplier: 1 (to a maximum of 1.35)

Foundation details to be in accordance with columns PS1

TWIN CABLE ENTRIES
COMPLETE WITH RADIUS CORNERS

(ESCALE: 1:40)

TYPICAL SPUNGARD GROUND PLANTED FOUNDATION

(MOUNTING PLAN
SCALE: 1:40)

REV | AMENDMENT | DESCRIPTION | BY | CK | DATE | DESIGN PARAMETERS:
--- | --- | --- | --- | --- | --- | ---
A | Initial issue | | | | | |

PROJECT: NATIONAL TRAFFIC SPECIFICATION – GENERIC POLE DESIGNS
ADDRESS: NZTA P43 SPECIFICATION FOR TRAFFIC SIGNALS

TITLE: SPUNLITE TYPE 8 HINGED NASSRA POLE – GROUND PLANT

PROJECT NUMBER | SHEET
--- | ---
- | C5

ORG SIZE | SCALE | REVISION
--- | --- | ---
A4 | AS SHOWN | A
Structural Notes:
- Minimum allowable soil bearing pressure shall be 100 kPa.
- Client to provide orientation and location.
- Contractor to check location of all services before commencing work.
- Provide conduit for cable entry as required.

Note:
Columns to be completely hot dip galvanized.
Foundation design information is supplied as a guide only and
must be in accordance with the columns PS1 and geotech report.

All columns available with cycle rail attachment brackets.
Cycle rail design detailed in type 11 drawing.

100NB Pipe
(Medium Wall)
114.3 O.D. x 4.5 I.D.
CHS Grade 250

100NB SCH 40 Pipe
(Heavy Wall)
114.3 O.D. x 6.02 CHS
Grade 250

Design Parameters:
- Design Working Life: 50 years
- Importance Level: 2
- Wind Region: 45 m/s
- Terrain / Height Multiplier: 2
- Shielding Multiplier: 1
- Hill Shape Multiplier: 1
- Lee Zone Multiplier: 1 (to a maximum of 1.35)

Foundation details to be in accordance with columns PS1

(Scale 1:30)
STRUCTURAL NOTES
- Minimum allowable soil bearing pressure shall be 100 kPa.
- Client to provide orientation and location.
- Contractor to check location of all services before commencing work.
- Provide conduit for cable entry as required.
- Only approved light fittings may be used, no additional attachments can be placed on pole without Spunlite's approval (Maximum light size: 0.15 m²
  with a CD=1.0, maximum light weight=15 kg)
- All dimensions shown are nominal.

NOTE:
Columns to be completely hot dip galvanized.
Foundation design information is supplied as a guide only and must be in accordance with the columns PS1 and Geotech Report.

DESIGN PARAMETERS:
- Design Working Life: 50 years
- Importance Level: 2
- Wind Region: 45 m/s
- Terrain / Height Multiplier: 2
- Shielding Multiplier: 1
- Hill Shape Multiplier: 1
- Lee Zone Multiplier: 1 (to a maximum of 1.35)

4, 6, or 8 x H/D Bolts

Typical Flange Based Foundation

Mounting Plan
(Scale: 1:40)

Rev Amendment Description By Ck Date
A Initial issue DE 07/15

PROJECT: NATIONAL TRAFFIC SPECIFICATION - GENERIC POLE DESIGNS
ADDRESS: NZTA P43 SPECIFICATION FOR TRAFFIC SIGNALS
TITLE: SPUNLITE TYPE 9 CYCLE MAST ARM COLUMN
100NB - FLANGE MOUNT

NZTA P43 SPECIFICATION FOR TRAFFIC SIGNALS City Council and Spur Lite Pole Ltd share authority of this work & retain intellectual & physical content.

PROJECT NUMBER -
ORG SIZE A4
SCALE AS SHOWN
REVISION A
FOUNDATION DETAILS TO BE IN ACCORDANCE WITH CCC ENGINEERS DESIGN

MOUNTING PLAN

FOUNDATION DETAILS TO BE IN ACCORDANCE WITH CCC ENGINEERS DESIGN  (SCALE 1:50)

MOUNTING PLAN  (SCALE 1:40)

PROJECT: NATIONAL TRAFFIC SPECIFICATION - GENERIC POLE DESIGNS
ADDRESS: NZTA P43 SPECIFICATION FOR TRAFFIC SIGNALS

TITLE: SPUNLITE TYPE 10 CYCLE JOINT USE MAST ARM (JUMA)
FLANGE MOUNT c/w STREET LIGHTING EXTENSION

PROJECT NUMBER -

SCALE AS SHOWN

REVISION A
100NB PIPE
HOT DIP GALVANIZED
PAINTED IN AN APPROVED 10YR PAINT SYSTEM

STRUCTURAL NOTES
- MINIMUM ALLOWABLE SOIL BEARING PRESSURE SHALL BE 100 Kpa.
- CLIENT TO PROVIDE ORIENTATION AND LOCATION.
- CONTRACTOR TO CHECK LOCATION OF ALL SERVICES BEFORE COMMENCING WORK.
- PROVIDE CONDUIT FOR CABLE ENTRY AS REQUIRED.

NOTE:
- COLUMNS TO BE COMpletely HOT DIP GALVANIZED.
- FOUNDATION DESIGN INFORMATION IS SUPPLIED AS A GUIDE ONLY AND MUST BE IN ACCORDANCE WITH THE COLUMNS PS1 AND GEOTECH REPORT.
- ALL COLUMNS AVAILABLE WITH CYCLE RAIL ATTACHMENT BRACKETS.
- CYCLE RAIL DESIGN DETAILED IN TYPE 11 DRAWING.

DESIGN PARAMETERS:
- DESIGN WORKING LIFE: 50 YEARS
- IMPORTANCE LEVEL: 2
- WIND REGION: 45 M/S
- TERRAIN / HEIGHT MULTIPLIER: 2
- SHIELDING MULTIPLIER: 1
- HILL SHAPE MULTIPLIER: 1
- LEE ZONE MULTIPLIER: 1 (TO A MAXIMUM OF 1.35)

40 NB MEDIUM GALV PIPE
Powder Coated
Interpol - Safety Yellow

GROUND PLANT DETAILS TO BE IN ACCORDANCE WITH COLUMNS PS1

(Scale 1:20)

RS114 RETENTION SOCKET PLAN
EXCLUSIVE AGENTS - SPUNLITE POLES

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PROJECT: NATIONAL TRAFFIC SPECIFICATION - GENERIC POLE DESIGNS
ADDRESS: NZTA P43 SPECIFICATION FOR TRAFFIC SIGNALS
TITLE: SPUNLITE TYPE 11 CYCLE NASSRA POLE - RS114 RETENTION SOCKET
ORG SIZE: A4
SCALE: AS SHOWN
REVISION: A

NZTA P43 SPECIFICATION FOR TRAFFIC SIGNALS City Council and State Government are the owner of this work & retain intellectual & financial rights.
STRUCTURAL NOTES
- Minimum allowable soil bearing pressure shall be 100 Kpa.
- Client to provide orientation and location.
- Contractor to check location of all services before commencing work.
- Provide conduit for cable entry as required.
- Only approved light fittings may be used, no additional attachments can be placed on pole without spunlite's approval (max. light size = 0.15 m² with a CD = 1.0, max. light weight = 15 kg)
- All dimensions shown are nominal.

NOTE:
Columns to be completely hot dip galvanized.
Foundation design information is supplied as a guide only and must be in accordance with the columns PS1 and geotech report.

DESIGN PARAMETERS:
- Design Working Life: 50 years
- Importance Level: 2
- Wind Region: 45 m/s
- Terrain / Height Multiplier: 2
- Shielding Multiplier: 1
- Hill Shape Multiplier: 1
- LEE Zone Multiplier: 1 (to a maximum of 1.35)

PROJECT: NATIONAL TRAFFIC SPECIFICATION - GENERIC POLE DESIGNS
ADDRESS: NZTA P43 SPECIFICATION FOR TRAFFIC SIGNALS

TITLE: SPUNLITE JOINT USE SIGNAL POLE (JUSP) - GROUND PLANT

PROJECT NUMBER
ORG SIZE
SCALE
REVISION

C9
A4
AS SHOWN
A
STRUCTURAL NOTES
- Minimum allowable soil bearing pressure shall be 100 Kpa.
- Client to provide orientation and location.
- Contractor to check location of all services before commencing work.
- Provide conduit for cable entry as required.
- Only approved light fittings may be used, no additional attachments can be placed on pole without Spunlite's approval (maximum light size=0.15m² with a CD=1.0, maximum light weight=15kg)
- All dimensions shown are nominal.

NOTE:
Columns to be completely hot dip galvanized.
Foundation design information is supplied as a guide only and must be in accordance with the columns PS1 and Geotech report.

DESIGN PARAMETERS:
- Design Working Life: 50 years
- Importance Level: 2
- Wind Region: 45 M/S
- Terrain / Height Multiplier: 2
- Shielding Multiplier: 1
- Hill Shape Multiplier: 1
- Lee Zone Multiplier: 1 (to a maximum of 1.35)

FOUNDATION DETAILS TO BE IN ACCORDANCE WITH COLUMNS PS1

(Scale 1:60)

MOUNTING PLAN
(Scale 1:40)
PROJECT: NATIONAL TRAFFIC SPECIFICATION – GENERIC POLE DESIGNS
ADDRESS: NZTA P43 SPECIFICATION FOR TRAFFIC SIGNALS
TITLE: SPUNLITE CCC CBD – JOINT USE SIGNAL POLE (JUSP) – 150NB PIPE POLE – RS168 RETENTION SOCKET

DESIGN PARAMETERS:
- Design Working Life: 50 years
- Importance Level: 2
- Wind Region: 45 m/s
- Terrain / Height Multiplier: 2
- Shielding Multiplier: 1
- Hill Shape Multiplier: 1
- Lee Zone Multiplier: 1 (to a maximum of 1.35)

NOTE:
- Columns to be completely hot dip galvanized.
- Foundation design information is supplied as a guide only and must be in accordance with the columns PST and Geotech report.

FOUNDATION DETAILS TO BE IN ACCORDANCE WITH CCC ENGINEERS DESIGN
SCALE: 1:50

RETENTION SOCKET FOUNDATION TO BE SPECIFIED BY CCC ENGINEER

RS168 RETENTION SOCKET PLAN
EXCLUSIVE AGENTS – SPUNLITE POLES

Diagram with dimensions and specifications related to the foundation and retention socket.
STRUCTURAL NOTES
- Minimum allowable soil bearing pressure shall be 100 kpa.
- Client to provide orientation and location.
- Contractor to check location of all services before commencing work.
- Provide conduit for cable entry as required.

- Only approved light fittings may be used. No additional attachments can be placed on pole without Spunlite's approval. (Maximum light size=0.15m² with a CD=1.0, maximum light weight=15kg)
- All dimensions shown are nominal.

NOTE:
Columns to be completely hot dip galvanized.
Foundation design information is supplied as a guide only and must be in accordance with the columns PS1 and Geotech report.

DESIGN PARAMETERS:
- Design Working Life: - 50 years
- Importance Level: - 2
- Wind Region: - 45 m/s
- Terrain / Height Multiplier: - 2
- Shielding Multiplier: - 1
- Hill Shape Multiplier: - 1
- Lee Zone Multiplier: - 1 (to a maximum of 1.35)

RETENTION SOCKET FOUNDATION TO BE SPECIFIED BY CCC ENGINEER

GROUND LINE MARK WITH VIVID MARKER

FOUNDATION DETAILS TO BE IN ACCORDANCE WITH COLUMNS PS1
(Scale 1:60)

REV | Amendment Description | By | Ck | Date |
---|------------------------|----|----|------|
A  | Initial issue          | DE |    | 07/15|

PROJECT: NATIONAL TRAFFIC SPECIFICATION - GENERIC POLE DESIGNS
ADDRESS: NZTA P43 SPECIFICATION FOR TRAFFIC SIGNALS
TITLE: Spunlite CCC Urban - Joint Use Signal Pole (JUSP) 150NB Pipe Pole - RS168 Retention Socket

PROJECT NUMBER: -
ORG SIZE: -
SCALE: A4
REVISION: A

SOURCE: NZTA P43 SPECIFICATION FOR TRAFFIC SIGNALS City Council and Spunlite Poles Ltd claim ownership of this work & retain intellectual & works copyright.

03-09-14 deg
### Appendix A

#### Steelgal JUMA with Spigot

#### Spunlite Type 2 Combined CCTV / Traffic Signal Pole

#### Spunlite Type 5s Mast arm with CCTV / COMMS Extension

#### Steelgal JUSP Pole

---

<table>
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<th>Rev</th>
<th>Amendment</th>
<th>Description</th>
<th>By</th>
<th>Ck</th>
<th>Date</th>
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<td>A</td>
<td>Initial issue</td>
<td></td>
<td>DE</td>
<td></td>
<td>07/15</td>
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**Design Parameters:**
- **Design Working Life:** -
- **Importance Level:** -
- **Wind Region:** -
- **Terrain Category:** -
- **Life Duration:** -

**Project:** NATIONAL TRAFFIC SPECIFICATION - GENERIC POLE DESIGNS
**Address:** NZTA P43 SPECIFICATION FOR TRAFFIC SIGNALS

**Title:** SPUNLITE & STEELGAL PHOTOS

**Project Number:** -
**Sheet:** C17
**Org. Size:** A4
**Scale:** AS SHOWN
**Revision:** A

---

NZTA P43 SPECIFICATION FOR TRAFFIC SIGNALS City Council and Spunlite Poles Ltd shall authorise this work & retain intellectual & property rights.
APPENDIX B – 5 METRE POLE TOP ASSEMBLY

Figure B01 – Pole Top Assembly

Figure B02 – Finial Cap Detail
NOTES

1. ALL ZINC PLATED ITEMS ARE TO BE PASSIVATED.

2. ITEM 13 TO BE WELDED TO TWO ITEMS 1. ALL WELDS TO BE FREE OF SCALE, GROUND
SMOOTH THEN ZINC PLATED AND PASSIVATED.

3. ALL THE EXPOSED EDGES OF ITEM 13 ARE TO BE ROUNDED OFF, THE EDGES TO BE 25 MIN
AND CORNERS TO BE 10 MIN TO PREVENT CABLE INSULATION DAMAGE.

4. ASSEMBLIES COMPRISING OF ITEMS 1-17 INCLUDING SHALL BE INDIVIDUALLY BOXED
COMPLETE WITH ALL PARTS, WITH A MOUNTING, READY FOR FIELD USE.

5. TOLERANCES (LINES) ANGULAR 5°.

6. FINISH OF ITEM 15: MATERIAL TO BE THOROUGHLY CLEANED, ETCHED, ALUMINIUM CHROMATED
AND DRIED BEFORE THE APPLICATION OF A POLYESTER-POWDER COATING OF 60um MINIMUM
THICKNESS - YELLOW DULL SILVER COLOUR.

7. UNLESS OTHERWISE INSTRUCTED ALL THREADS TO BE THROUGH FULL THICKNESS OF MATERIAL.

8. ALL EQUIPMENT MUST COMPLY WITH AS 2339 "TRAFFIC SIGNAL POST & ATTACHMENTS".

9. MANUFACTURERS IDENTIFICATION AND DATE OF MANUFACTURE SHALL BE MARKED ON THE
CASTING ITEM CLEARLY, PERMANENTLY AND WEATHER RESISTANT.

10. AN APPROVED ANTI-SEIZE COMPOUND CONTAINING ZINC DUST SHALL BE APPLIED TO ALL
TAPPED HOLES IN THE CASTING.

11. ITEM 6, M6 SET SCREW, END TO BE ROUNDED, THUS:

12. ITEM 15 SHALL BE 500mm LONG AND 300mm WIDE. THE THICKNESS OF
ITEM 17 SHALL BE AT LEAST 50mm.

13. ITEM 6 TO BE INSERTED INTO 2 SIDES
48mm APART (REFER NOTE 14)
INSTALL FINAL CAP harvesting wire rope
UNDER HEAD OF ITEM 6 AS SHOWN.

14. RECOMMENDATION OF CONTENTS MANUFACTURERS IDENTIFICATION AND DATE OF
MANUFACTURE SHALL BE MARKED ON THE
ASSEMBLIES (COMPRISING OF ITEMS 1-17 INCLUSIVE) SHALL BE INDIVIDUALLY BOXED
AND CLEARLY MARKED EXTERNALLY WITH:

(a) DESCRIPTION OF CONTENTS
(b) MANUFACTURERS IDENTIFICATION
(c) RTA ORDER NO

15. POST TOP ASSEMBLIES TO BE INDIVIDUALLY PACKED FOR PROTECTION IN TRANSPORT
AND CLEARLY MARKED EXTERNALLY WITH:

(i) DESCRIPTION OF CONTENTS
(ii) MANUFACTURERS IDENTIFICATION
(iii) DATE OF MANUFACTURE

16. ALL EQUIPMENT MUST COMPLY WITH AS 2339 "TRAFFIC SIGNAL POST & ATTACHMENTS".

17. PART ASSEMBLIES (COMPRISING OF ITEMS 1-17 INCLUSIVE) SHALL BE INDIVIDUALLY BOXED
AND CLEARLY MARKED EXTERNALLY WITH:

(i) DESCRIPTION OF CONTENTS
(ii) MANUFACTURERS IDENTIFICATION
(iii) DATE OF MANUFACTURE

18. MODEL OF THE PRODUCT IS TO BE MARKED "TRAFFIC SIGNAL POST & ATTACHMENTS"
ON THE BOX.

19. REFERENCE DRAWINGS

PLAN

TOP ASSEMBLY
TRAFFIC SIGNAL POST

ROADS AND TRAFFIC AUTHORITY NSW

ISSUE 28-05-96

SUPERSEDES ISSUE AC
ISSUE 90-02-07

RED NO
VM200-15
Sheet Size: A2

Quantity

Sheet No

Reference Drawings

VM200-15

TOP ASSEMBLY
TRAFFIC SIGNAL POST

Sheet size: A2

File No

Scale

NOTE X

THE EXPOSED THREAD LENGTH
OF THE BOLT
ITEM 2 SHALL NOT BE LESS
THAN 25mm & NOT MORE THAN 25mm.

ITEM 6 TO BE INSERTED INTO 2 SIDES
48mm APART (REFER NOTE 14)
INSTALL FINAL CAP harvesting wire rope
UNDER HEAD OF ITEM 6 AS SHOWN.

ELEVATION

ALL DIMENSIONS IN MILLIMETRES

<table>
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<th>DESCRIPTION</th>
<th>MATERIAL/DRAWING NUMBER</th>
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<td>NO PLASTIC</td>
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<tr>
<td>2</td>
<td>FLAT</td>
<td>NATURAL</td>
</tr>
<tr>
<td>3</td>
<td>FLAT</td>
<td>HD GALVANISED</td>
</tr>
<tr>
<td>4</td>
<td>FLAT</td>
<td>HD PLASTIC</td>
</tr>
<tr>
<td>5</td>
<td>FLAT</td>
<td>MILD STEEL</td>
</tr>
<tr>
<td>6</td>
<td>FLAT</td>
<td>STAINLESS STEEL</td>
</tr>
<tr>
<td>7</td>
<td>FLAT</td>
<td>AL ALLOY TO AS1874</td>
</tr>
<tr>
<td>8</td>
<td>FLAT</td>
<td>PARA ALLOY TO AS4780</td>
</tr>
<tr>
<td>9</td>
<td>FLAT</td>
<td>GALVANISED</td>
</tr>
<tr>
<td>10</td>
<td>FLAT</td>
<td>PARA ALLOY TO AS4780</td>
</tr>
<tr>
<td>11</td>
<td>FLAT</td>
<td>MILD STEEL</td>
</tr>
<tr>
<td>12</td>
<td>FLAT</td>
<td>STAINLESS STEEL</td>
</tr>
<tr>
<td>13</td>
<td>FLAT</td>
<td>PARA ALLOY TO AS4780</td>
</tr>
<tr>
<td>14</td>
<td>FLAT</td>
<td>PARA ALLOY TO AS4780</td>
</tr>
<tr>
<td>15</td>
<td>FLAT</td>
<td>PARA ALLOY TO AS4780</td>
</tr>
<tr>
<td>16</td>
<td>FLAT</td>
<td>PARA ALLOY TO AS4780</td>
</tr>
<tr>
<td>17</td>
<td>FLAT</td>
<td>PARA ALLOY TO AS4780</td>
</tr>
</tbody>
</table>
MANUFACTURING DETAILS FOR ITEM 1

MATERIAL: UV STABILISED POLYPROPYLENE.

FINISH: SMOOTH MOULD FINISH.

COLOUR: TO CONFORM WITH AS 2700 COLOUR NO T33, SMOKE BLUE. PIGMENT TO BE MIXED INTO MOULDING MATERIAL. REFER TO AS 2339-1987 ADDITIONAL REQUIREMENTS (CLAUSE 4.3).

GENERAL: THE FINISHED CAP SHALL PASS THE FOLLOWING TESTS WITHOUT FUNCTIONAL IMPAIRMENT:

(a) FREE FALL FROM 4 METRES ONTO A CONCRETE SURFACE
(b) FIVE DROPS IN DIFFERENT RELEASE ORIENTATIONS.

NOTES

1. MANUFACTURER'S IDENTIFICATION AND DATE OF SUPPLY TO BE MARKED CLEARLY, INDELIBLY AND WEATHER RESISTANT IN A CONVENIENT POSITION INSIDE THE CAP.


3. THE ARRESTING WIRE ROPE (ITEM 2) AND ITEMS 4, 5 & 6 SHALL BE SUPPLIED FITTED TO THE OUTSIDE OF THE FINIAL CAP.

4. VARIATION IN WALL THICKNESS NOT TO EXCEED 15% OF AVERAGE THICKNESS.

GENERAL:

THE FINISHED CAP SHALL PASS THE FOLLOWING TESTS WITHOUT FUNCTIONAL IMPAIRMENT:

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(b) FIVE DROPS IN DIFFERENT RELEASE ORIENTATIONS.

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REFERENCES PLAN

REFERENCE PLANS

SPLT FINIAL CAP VM213-2
ARRESTING WIRE VM200-20
POST TOP ASSY VM200-15
SUPPLY CAT NO 7002 1242

ROADS AND TRAFFIC AUTHORITY OF NSW
TRAFFIC SIGNALS

FINIAL CAP FOR TRAFFIC SIGNAL POST TOP ASSEMBLY

SCALE APPROVED 23-10-1985
DRAWN F.R. HULSCHER
CHECKED R.J. 21-10-85
ISSUE 4

ABOVE

ATLAS STEEL, VILLAWOOD
PATINA PLASTICS, 65 HENDERSON RD, TURRELLA

NYLON

MATERIAL: AVAILABLE DRG NO 7002 1242

1. MANUFACTURER'S IDENTIFICATION AND DATE OF SUPPLY TO BE MARKED CLEARLY, INDELIBLY AND WEATHER RESISTANT IN A CONVENIENT POSITION INSIDE THE CAP.


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DRAWN F.R. HULSCHER
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ISSUE 4

ABOVE

ATLAS STEEL, VILLAWOOD
PATINA PLASTICS, 65 HENDERSON RD, TURRELLA

NYLON

MATERIAL: AVAILABLE DRG NO 7002 1242
APPENDIX C – INDUCTIVE LOOP LAYOUT DETAILS

Notes:

① Dimension derived from the lane width stated on the design plan.
② Distance between the loops will depend on geometry layout and right turn filtering position of vehicle.
③ 0.7m distance to be 0.5m when the loop and lane is separated more than 0.5m using for example a median or painted line.
④ Distance 1.5m from stop line (F.S.L.) unless otherwise stated on the design plan.
⑤ Distance between 1.0-3.0m from primary pole location unless otherwise stated on the design plan.
⑥ Where no details have been supplied it shall be 1.0m.
⑦ Feeders shall all be in separate slots, one slot per loop pair to kerb face and be a minimum of 0.3m apart from other slots.
⑧ Service covers shall be at least 0.3m from any loop cable slot.
⑨ As built information to show locations of loop feeder cables in relation to the site equipment including pole, kerb faces, medians, service covers, distance to the stop line shall be recorded on the as built plan from stop line (F.S.L.) to start of loop.
⑩ Through kerb joint using minimum 405mm concrete saw, wire shall have minimum 12mm cover and be sealed the same as detector loops.
⑪ Offset loops 0.7m from the road lane markings adjacent to the loop, where lane loop is adjacent to kerb face use edge of seal to offset 0.7m to loop.

Figure C01 – Vehicle loop details
Figure C02 – Cycle loop details
APPENDIX D – POLE DUCT ACCESS DETAILS

Figure D01 - Duct access details  [SL to get better drawing done]
APPENDIX E – LANTERN SHROUD DETAILS - INFORMATIVE

Figure E01 – Vehicle lantern shroud
## APPENDIX F - CABLE TERMINATION CHART

### C.C.C TRAFFIC SIGNAL CABLE CONNECTION CHART

**INTERSECTION NO:** 3 5 5  
**LOCATION:** GRAHAMS/MEMORIAL  
**LAST UPDATED:** OCT 2001

<table>
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<tr>
<th>Pole Number</th>
<th>T To Pole No::</th>
<th>T To Pole:</th>
<th>T To Pole:</th>
<th>T To Pole:</th>
<th>T To Pole:</th>
<th>T To Pole:</th>
<th>T To Pole:</th>
<th>T To Pole:</th>
<th>T To Pole:</th>
<th>T To Pole:</th>
<th>T To Pole:</th>
<th>T To Pole:</th>
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<td>R</td>
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<td>R</td>
<td>R</td>
<td>R</td>
</tr>
<tr>
<td>Number of cores</td>
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<td>25</td>
<td>25</td>
<td>R</td>
<td>R</td>
<td>R</td>
<td>R</td>
<td>R</td>
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<td>R</td>
<td>R</td>
<td>R</td>
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<td>R</td>
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<tr>
<td>Cable Direction</td>
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<td>11</td>
<td>C</td>
<td>3</td>
<td>2</td>
<td>4</td>
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<td>8</td>
<td>6</td>
<td>7</td>
<td>8</td>
<td>6</td>
</tr>
</tbody>
</table>

*NOTE: TERMINAL NO. = CORE NO. UNLESS SHOWN OTHERWISE

ONLY ACTIVE CONNECTIONS & CHANGES IN CORE NO. SHOWN

**LAST UPDATED:** OCT 2001

### Figure F01 - Cable termination chart

- C.C.C TRAFFIC SIGNAL CABLE CONNECTION CHART
- INTERSECTION NO: 3 5 5
- LOCATION: GRAHAMS/MEMORIAL
- LAST UPDATED: OCT 2001
- CABINET POLE 1 POLE 2 POLE 3 POLE 4 POLE 5 POLE 6 POLE 7 POLE 8 POLE 9 POLE 10 POLE 11 POLE 12
- T To Pole No:: 25 25 25 R R R R R R R R R R R R
- Number of cores 25 25 25 R R R R R R R R R R R R
- Cable Direction 1 11 C 3 2 4 3 6 5 7 8 6 7 8 6
- **GROUP**
  - OUTPUT A YEL 2 2 2
  - OUTPUT A GRN 3 3 3
  - OUTPUT A RED 1 1 1
  - **GROUP**
  - OUTPUT 5 5 5
  - **GROUP**
  - OUTPUT 9 9 9
  - **GROUP**
  - OUTPUT 12 12 12
  - **GROUP**
  - OUTPUT 15 15 15
  - **GROUP**
  - OUTPUT 18 18 18
  - **GROUP**
  - OUTPUT 20 20 20
  - **GROUP**
  - OUTPUT 21 21 21
  - **GROUP**
  - OUTPUT 22 22 22
  - **GROUP**
  - OUTPUT 23 23 23
  - **GROUP**
  - OUTPUT 24 24 24
  - **GROUP**
  - OUTPUT 25 25 25
  - **GROUP**
  - DET NO 13 13 13
  - **GROUP**
  - DET NO 14 14 14
  - **GROUP**
  - DET NO 15 15 15
  - **GROUP**
  - DET NO 16 16 16
  - **GROUP**
  - DET NO 17 17 17
  - **GROUP**
  - DET NO 18 18 18
  - **GROUP**
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  - **GROUP**
  - DET NO 22 22 22
  - **GROUP**
  - DET NO 23 23 23
  - **GROUP**
  - DET NO 24 24 24
  - **GROUP**
  - DET NO 25 25 25
  - **GROUP**
  - EARTH 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4
  - **GROUP**
  - DET. RETURN 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5
  - **GROUP**
  - PHASE 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6
  - **GROUP**
  - NEUTRAL 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7

Figure F01 - Cable termination chart
## APPENDIX G – SITE ACCEPTANCE TEST CHART

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<tbody>
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<table>
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<tr>
<td>Commencement date</td>
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<tr>
<td>Signals and civil contractor</td>
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</table>

<table>
<thead>
<tr>
<th>Pre-inspections</th>
<th>Y/N or N/A</th>
<th>Comments</th>
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<tbody>
<tr>
<td>Duct connections to poles</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Loops positioned correctly</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Recorded loop positions</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Texiphalte installed cleanly</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&gt; 12 mm loop feeder cover</td>
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<table>
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<th>Comments</th>
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<tbody>
<tr>
<td>E-Prom labelled (check sum)</td>
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<td></td>
</tr>
<tr>
<td>Lamps off, controller ops</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Copy RAM to controller</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Check fault log, clear</td>
<td></td>
<td></td>
</tr>
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<table>
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<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Flash test each Signal Group</td>
<td></td>
</tr>
<tr>
<td>Flashing ambers working</td>
<td></td>
</tr>
<tr>
<td>Check all red (SPT = 10 s)</td>
<td></td>
</tr>
<tr>
<td>Revision on correct phases</td>
<td></td>
</tr>
<tr>
<td>All default phases call</td>
<td></td>
</tr>
<tr>
<td>Monitor operations in HHT</td>
<td></td>
</tr>
<tr>
<td>After full start up:</td>
<td></td>
</tr>
<tr>
<td>Other phases call (xsf/flags)</td>
<td></td>
</tr>
<tr>
<td>Ped protection OK</td>
<td></td>
</tr>
<tr>
<td>Mains off-on, controller ops OK?</td>
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<tr>
<td>Last gasp (PF in SCATS Log)</td>
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<th>Y/N or N/A</th>
<th>Comments</th>
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<td></td>
</tr>
<tr>
<td>Concrete collar (500 mm)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Painted</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fold down poles work</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pole numbers installed &amp; manufactures date fitted</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>All lanterns</th>
<th>Y/N or N/A</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Attached and aligned correctly</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Locking device, spring washers, and lock nuts fitted</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Correct height (3.2 m - 4.1 m)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Directional arrows aligned</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Louvres installed correctly</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Correct visors installed</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ped lanterns:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Attached correctly</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ped lantern height/align (3 m)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Correct visors installed</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table G01 – Site acceptance sheet 1 of 3
<table>
<thead>
<tr>
<th>Intersection name:</th>
<th></th>
<th>Date:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number:</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Pedestrian crossing</th>
<th>Y/N or N/A</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Push buttons:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Install correct height (1.1 m)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Callbox Operating (calling walk)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sound levels (High)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Audio unit audible (operating)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mutable unit OK (if fitted)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Arrow aligned to crossing</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tactile vibration OK</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PB light indicator (if fitted)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Ped Detectors:</th>
<th>Y/N or N/A</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Camera installed OK</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Camera activates OK</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Instruction labels installed</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Controller</th>
<th>Y/N or N/A</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Make, type, and size</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Signal group size/No. of</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Detector card size/No. of</td>
<td></td>
<td></td>
</tr>
<tr>
<td>DP number</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ICP number</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Det card operation check</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gland plate labels (on top)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cable looms labels (under)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Detector switches labelled</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Signal groups numbered</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Detector blocks numbered</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cable glands sealed</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Spare sockets working</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wiring tidy</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Logic rack secure</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Door seals and locks</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Vehicle detectors</th>
<th>Y/N or N/A</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>KJB 100 mm concrete surround</td>
<td></td>
<td></td>
</tr>
<tr>
<td>KJB 20 mm concrete pad</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Loop joins using approved method</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&gt; 1.8 m slack in controller base</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&gt; 0.5 m slack in KJB</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Cabling and earthing</th>
<th>Y/N or N/A</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Telecom cable identified</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Impedence test reports</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Street lighting labelled</td>
<td></td>
<td></td>
</tr>
<tr>
<td>RCDs labelled</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table G01 – Site acceptance sheet 2 of 3 (continued)
<table>
<thead>
<tr>
<th>Intersection name:</th>
<th>Number:</th>
<th>Date:</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Cabling and earthing</th>
<th>Y/N or N/A</th>
<th>Comment/s</th>
</tr>
</thead>
<tbody>
<tr>
<td>Draw cables installed/work</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Controller cabinet earthed</td>
<td></td>
<td></td>
</tr>
<tr>
<td>In cable slack in chambers</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Civil Works</th>
<th>Y/N or N/A</th>
<th>Comment/s</th>
</tr>
</thead>
<tbody>
<tr>
<td>Connect ducting as per specs</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chambers level with surface</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Plastered inside chamber</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Kerbing installed correctly</td>
<td></td>
<td></td>
</tr>
<tr>
<td>KJB concrete installed (100 mm)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>KJB drainage installed (100 mm)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Road surface condition</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Footpath surface condition</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pram ramps installed</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Directional Pavers Aligned</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Road markings installed</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Drainage, ESP at crossings</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Grass berms restored</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Correct signage installed</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Temp advance warnings</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Documentation</th>
<th>Y/N or N/A</th>
<th>Comment/s</th>
</tr>
</thead>
<tbody>
<tr>
<td>In controller (Laminated)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Controller information sheet</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intersection information sheet</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intersection as-built drawing</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Electrical Certificate of Compliance (incl Earth Loop Impedance Values for each pole)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Log book</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Other</th>
<th>Y/N or N/A</th>
<th>Comment/s</th>
</tr>
</thead>
</table>

Commissioning/Switch-on date: 
RCA Traffic Signal Engineer: 
Sign: Date: 
Signal contractor: 
Sign: Date: 

HAND OVER TO RCA FOR OPERATIONS AUTHORISED WHEN SIGNED ABOVE

Table G01 – Site acceptance sheet 3 of 3 (continued)
## APPENDIX H – CONTROLLER BENCH TESTING FORM

<table>
<thead>
<tr>
<th>Intersection name</th>
<th>Controlling authority:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intersection identification</td>
<td>Intersection number:</td>
</tr>
<tr>
<td>Personality file number</td>
<td></td>
</tr>
<tr>
<td>Date PROM created</td>
<td></td>
</tr>
<tr>
<td>Name of PROM tester</td>
<td></td>
</tr>
<tr>
<td>Date PROM bench tested</td>
<td></td>
</tr>
<tr>
<td>PROM bench test</td>
<td>Pass</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Test</th>
<th>Result/comment</th>
<th>Signed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time settings - Vehicle</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Time settings - Pedestrian</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Time settings - Presence</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Time settings - Special purpose</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Flexilink call data</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Filter operation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Special logic</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Calling detectors</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Phase movements</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Conflict matrix</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ram version</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Functionality</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table H01 - Controller bench test form
APPENDIX J – NEW INTERSECTION COMMISSIONING FORM

Table J01 – New installation acceptance (NIA) checklist follows on next page
<table>
<thead>
<tr>
<th>Description</th>
<th>Evidence</th>
<th>Check</th>
</tr>
</thead>
<tbody>
<tr>
<td>Traffic signal controller</td>
<td>RTA type approval – Module</td>
<td></td>
</tr>
<tr>
<td></td>
<td>RTA type approval – Housing</td>
<td></td>
</tr>
<tr>
<td>LED aluminium lanterns</td>
<td>RTA type approval for each lantern type</td>
<td></td>
</tr>
<tr>
<td></td>
<td>NATA certified laboratory report</td>
<td></td>
</tr>
<tr>
<td>Poles under 5.2 m</td>
<td>Comply with AS 2339</td>
<td></td>
</tr>
<tr>
<td></td>
<td>SUMB to be an RTA approved UMB</td>
<td></td>
</tr>
<tr>
<td>Poles over 5.2 m</td>
<td>Engineers design and certificate of compliance</td>
<td></td>
</tr>
<tr>
<td>Poles (posts)</td>
<td>Design certificate and a certificate of compliance from a suitable Chartered Professional Engineer (CPEng)</td>
<td></td>
</tr>
<tr>
<td>RAMM collection sheet</td>
<td>Completed RAMM Asset Data Form (Appendix K)</td>
<td></td>
</tr>
<tr>
<td>Test certificates</td>
<td>Original certificate of compliance</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Bench testing laboratory statement/certificate with the test engineers signature</td>
<td></td>
</tr>
<tr>
<td>Supply of electric power</td>
<td>The original of the certificate of compliance</td>
<td></td>
</tr>
<tr>
<td>Producer statements/Hardware guarantees</td>
<td>Certified copy of products/equipment on a signed and dated paper with company letterhead, as well as a copy of the drawing for the products/equipment being certified</td>
<td></td>
</tr>
<tr>
<td>Documentation</td>
<td>Instruction manual</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Both two hardcopies and an electronic copy of controller information sheet and cable termination chart</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Cabling and ducting record</td>
<td></td>
</tr>
<tr>
<td>Reflector</td>
<td>Comply with AS/NZS 2144</td>
<td></td>
</tr>
<tr>
<td>Visors and louvre</td>
<td>Comply with AS/NZS 2144</td>
<td></td>
</tr>
<tr>
<td>Pedestrian push button assemblies</td>
<td>Comply with AS 2353</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Approved push button units</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Approved audio tactile driver and housing</td>
<td></td>
</tr>
<tr>
<td>Vehicle loop detectors</td>
<td>Comply with AS 2703</td>
<td></td>
</tr>
<tr>
<td>Detector loop wire</td>
<td>Comply with AS/NZS 2276.3</td>
<td></td>
</tr>
<tr>
<td>Earthing/bonding</td>
<td>Comply with AS/NZS 3000:2007</td>
<td></td>
</tr>
<tr>
<td>Switch/Earth termination</td>
<td>Comply with IEC 60947-7-1, IEC 60998-1, and IEC 60998-2-1</td>
<td></td>
</tr>
<tr>
<td>As-built drawings</td>
<td>Supplied as hardcopy and in AutoCAD.DWG formats</td>
<td></td>
</tr>
<tr>
<td>C &amp; I</td>
<td>Hard copy and spreadsheet formats</td>
<td></td>
</tr>
<tr>
<td>Keys</td>
<td>Two full sets</td>
<td></td>
</tr>
</tbody>
</table>
APPENDIX K – RAMM ASSET DATA FORM

<table>
<thead>
<tr>
<th>Int #</th>
<th>Date:</th>
<th>Int Name</th>
<th>Road the pole is on</th>
<th>Lantern</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Target board</td>
<td></td>
</tr>
<tr>
<td>Item</td>
<td>Pole No.</td>
<td>Pole Mount (G.p., Flange, etc.)</td>
<td>No. of aspects</td>
<td>Road name - Material (plastic or metal)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table K01 – Asset information form
APPENDIX L – CONTROLLER GLAND PLATE - INFORMATIVE

Figure L01 – Bottom of controller with gland plate fitted and access panel fitted

Figure L02 – Bottom of controller cabinet with gland plate access panel removed
APPENDIX M – CYCLE CALL ACCEPT INDICATOR - INFORMATIVE

Figure M01 – Cycle call accept indicator (no call present).
* Note – Blanking plate fitted to push button as automatic detection installed.

Figure M02 – Cycle call accept indicator displaying call present.
APPENDIX N – MOUNTING STARP LOCKING MECHANISM

Figure N01 – Mounting Strap Locking Mechanism follows on next page
NOTES

1. REMOVE SHARP EDGES & CORNERS.
2. MATERIAL: STAINLESS STEEL GRADE 304 2B DULL.
3. FINISH: NATURAL.
4. TOLERANCE UNLESS OTHERWISE STATED:
   - GENERAL DIMENSIONS ±0.5mm
   - ANGULAR ±1°

DIMENSIONS IN MILLIMETRES

13 RAISED DIMPLES Ø4.0 ±0.1
EQUISPACED WITH TOP
DIMPLE ON THE CENTRE LINE

REFERENCE DRAWINGS

MOUNT STRAP VM012-7
LOWER MTG BKT VM200-14

RTA SUPPLY CAT NO
18233542

STANDARD LOCK WASHER FOR
LANTERN MOUNTING STRAP
AND LOWER MOUNTING BRACKET