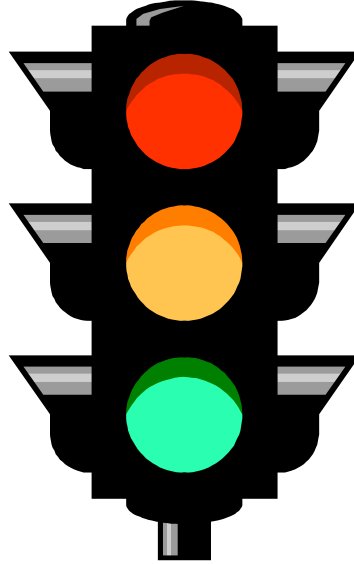


# **SPECIFICATION**



**NATIONAL**  
**TRAFFIC SIGNAL**  
**SPECIFICATION**

Revision 2  
1 September 2005

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## APPENDICES

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Appendix C	Intersection Layout Sheet
Appendix D	Sample Special Conditions

## DISCLAIMER

This specification has been produced by members of the National Signals Committee and the Signals New Zealand User Group (SNUG) and includes input from representatives of the traffic signal industry.

It is the combination of several specifications from the larger cities and brings together the best practice and procedures currently in use throughout the country. Users of this specification must ascertain for themselves that it represents the requirements of their clients or Road Controlling Authority (RCA).



## SECTION 1

### MINIMUM REQUIREMENTS OF SIGNAL EQUIPMENT

#### 1.1 Scope

This Section of the Specification covers the requirements of all signal equipment offered for supply including local signal controller and cabinet, detectors, lanterns, target boards, visors, poles and push button assemblies.

#### 1.2 Signal Equipment Compliance

All traffic signal components must comply with this specification and must either:

- (a) Have been previously supplied to the Road Controlling Authority (RCA) / Client and found satisfactory in operation, or
- (b) Be demonstrated in a working condition to the RCA / Clients Engineer before the closing date for tenders. The Engineer may give provisional approval if the equipment appears satisfactory.

The equipment shall also comply with all relevant electrical regulations and local Power Supply Authorities requirements.

##### 1.2.1 Provisional Approval

Provisional approval for non complying equipment may be given by the RCA / Client 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 type approval will be required to operate in accordance with this Specification and will not remove the Contractors obligations under Section 4 regarding maintenance. In many cases, equipment with provisional type approval may require maintaining for a longer period than one year. The Contractor will be notified of this period when granted provisional type approval. Maintenance, at no cost to the RCA / 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.

##### 1.2.2 Guarantee Period

All new equipment supplied by the contractor / supplier shall be guaranteed against faulty materials and workmanship for a period of one year from the date of installation.

Any item found to be faulty shall be replaced or repaired by the contractor / supplier at no cost to the RCA / Client.

#### 1.3 Traffic Signal Controller

Only controllers complying with RTA Specification TSC/3 or TSC/4 shall be acceptable (REV 2)

##### 1.3.1 RTA TSC/4 Compliant Controllers

###### 1.3.1.1 General Requirements

The TSC/3 compliant signal controller shall comprise:

- The controller cabinet (refer clause 1.3.2)
- The logic unit complete with input, output, power, control, communications and processor modules.
- A site identification card.
- A 3-position external facility switch (off - normal – maintenance (flashing yellow))
- A Tele-permitted line isolation unit for SCATS connection complete with 1.5 metres of cable with a B/T plug on one end wired to pins 1 and 6.
- A flashing yellow power flasher unit.
- Lamp dimming/voltage regulation.

- All wiring, looms, terminals, rails, gear tray etc necessary to complete the installation of the signal controller.

New controllers not currently operating in the RCA / Clients area that require a separate Hand Held Terminal (HHT), to interrogate and setup the controller, shall come complete with two HHT's.

The logic unit shall:

- Be capable of operating at least 16 signal groups however, unless specified only the required number of signal groups needed for the site shall be provided.
- Incorporate solid-state load switching of signal groups.
- Be provided with the specified number of detectors and inputs. HOWEVER the logic rack MUST be capable of being expanded to accept at least 24 vehicle detectors plus 8 external inputs (ie for pedestrian push buttons) (REV 2)
- Be able to monitor lamp loads for all signal groups and when used with LED lanterns, to be able to measure lamp loads down to 5 watts. (REV 2)
- Be, at minimum, SCATS VC 4 compatible.
- Be approved by RTA (NSW).
- Be able to automatically or via SCATS dim the signal group lantern outputs by at least 20%.
- Regulate the voltage supplied to the lamps to within  $\pm 2\%$ .
- Provide full operation when the intersection is fitted with LED lanterns that comply with the Australian / NZ Standard for Traffic Signal Lanterns AS/NZS 2144:2002
- Revert to FAULT mode on last RED out for all MAJOR signal groups (REV 1)
- Be capable of controlling different lamp types on individual signal groups or LCB's (REV 1)

### 1.3.1.2 *Controller Cabinet*

The controller cabinet shall have the following features:

Dimensions: Minimum internal dimensions of 1205 mm high by 410 mm deep by 565 mm wide.

Materials: 2.5 mm Aluminium Alloy.

Construction:

- A front door with three internal hinges on the left-hand side.
- Recessed handles complete with top and bottom rods and side tongue for locking and using a key type as specified by the RCA (refer to the Special Conditions to this Specification). (REV 2)
- The door is to be constructed so the levering of the door open with a screwdriver or crow bar is not possible.
- Have welded construction with no rivets or nuts or bolts visible from the outside.
- Be stiffened to prevent the cabinet from flexing once installed.
- Be ventilated at the bottom and top to facilitate circulating airflow.
- Be weather proof and vermin proof (including the ventilation grills)
- Include a document holder, capable of holding 4 A4 laminated sheets, securely fixed to the inside of the door. The holder must be at least 2/3rds the height of an A4 sheet and be free draining.
- A shelf installed across the full width of the cabinet but with 50 mm clearance from the front face. The clearance between the top of the cabinet and the shelf shall be 450 mm or sufficient to hold the controller logic module.
- Have sufficient mounting rails to secure all field wiring terminations and internal hardware.
- A switchboard mounted on the gear plate facing forward or on the right-hand side cabinet wall, pre-wired for the Local Electrical Supply Authority's requirements. The transformer and contactors are to be easily accessible. Note that some electricity supply authorities require a meter to be able to be read via a window in the door. (REV 2)
- Provision for mounting the 3 pole facility switch on the top front right hand side of the cabinet.
- Be designed to prevent direct access to 230V potential wiring when the front door is open. This may be achieved by the use of a 3 mm clear plastic cover.

Surface Preparation – All internal and external surfaces shall be powder coated to a minimum dry film thickness of 50 microns. Unless specified, the coating colour shall be Grey.

### 1.3.1.3 *External Operating Facilities For Lamp Control*

Provision shall be made to switch the signal lanterns “on” or “off” or “flashing yellow” external to the controller housing by the standard type triangular facility key incorporating a brass shaft. This switch shall

control the signal lamp circuit only and in its “off” or “flashing yellow” position shall leave the control equipment fully operative.

The switch positions shall be:

left	-	off
centre	-	flashing yellow (maintenance)
right	-	normal operating mode (on)

#### **1.3.1.4 Service Switchboard**

Each traffic signal controller cabinet shall be provided with a proprietary service switchboard that shall include:

- One single pole mains power isolation switch (30A).
- One controller circuit breaker (10A).
- One signal lamp circuit breaker (16A) to suit the cable size. (REV 2)
- One flashing yellow circuit breaker (10A).
- One general purpose outlet circuit breaker (10A).
- One neutral bar with a minimum of 4 ways. (REV 2)
- One earth bar with a minimum of 4 ways. (REV 2)
- One double switched 3 pin socket

The switchboard shall be positioned to provide unobstructed access to the main field wiring terminals. The recommended location for the switchboard is mounted on the right-hand wall of the cabinet

#### **1.3.2 RTA TSC/4 Compliant Controllers**

TSC 4 compliant traffic signal controllers shall comply with the RTA’s TCS/4 specification with the following exceptions: -

- 1) The controller cabinet may be manufactured locally
- 2) Local power supply authority meter requirements
- 3) Field wiring termination blocks

The above exceptions shall comply with the requirements as detailed in section 1.3.1

### **1.4 Signal Lanterns**

#### **1.4.1 General**

The technical requirements for Traffic Signal Lanterns shall be as stipulated in AS/NZS 2144: 2002 (including amendments as issued from time to time), subject to the following provisions and exceptions.

For quartz-halogen optical systems, the lanterns shall be supplied complete with 10V quartz-halogen traffic signal lamps conforming to the relevant requirements of Standard Sheet 6004 of IEC 357 with wattage as specified in clause 1.4.3.

#### **1.4.2 Signal Sizes**

The nominal size of pedestrian and general-purpose signals as referred to in clause 3.3 of AS/NZS 2144:2002 shall be 200 mm.

The nominal size of extended range signals as referred to in clause 3.3 of AS/NZS 2144:2002 shall be 300 mm. (Note: Extended range signals shall be used on all overhead mastarm displays and on high speed approaches).

#### **1.4.3 Quartz Halogen Lanterns**

##### **1.4.3.1 Lamps**

The 200 mm pedestrian and general purpose lantern shall comply with the photometric and colorimetric requirements of AS/NZS 2144: 2002 when fitted with a 35 watt 10V lamp which complies with RTA Specification No QHL/1 “Quartz Halogen Traffic Signal Lamps (10V)”.

The 300 mm extended range lantern shall comply with the photometric and colorimetric requirements of AS/NZS 2144: 2002 when fitted with a 50 watt 10V lamp which complies with RTA Specification No QH2/1 “Quartz Halogen Traffic Signal Lamps (10V)”.

All lamps shall be fitted with twin fly leads

#### 1.4.3.2 *Lampholder*

The lampholder shall be designed to accommodate the PKX22S base, such that lamps can be conveniently replaced with one hand without the use of tools. The lampholder shall be mounted on the reflector such that the lamp can be inserted and removed from the back of the reflector.

The receptacle for the flying leads of the lamp shall be located such that leads of length 100-280 mm can be accommodated.

The exposed parts of the lampholder shall be earthed.

#### 1.4.3.3 *Lens*

The exposed lantern face shall have a diameter in relation to the nominal lantern size defined in clause 1.4.2 above as follows:

Nominal Size	Minimum Diameter	Maximum Diameter
200 mm	190 mm	200 mm
300 mm	272 mm	280 mm

The rim of the lens should be provided with a device to ensure that:

- (a) the lenses cannot be used with incompatible optical systems and
- (b) the lenses can only be fitted the correct way up.

#### 1.4.3.4 *Reflector*

Reflectors shall comply with Section 7.3 of AS/NZS 2144: 2002.

The reflector shall form an integral assembly with the door (which houses the lens) and the lampholder, such that the optical cavity is dustproof (to category IP52 under AS 1939) when a lamp is inserted from the rear. Provision shall be made for the fitting of metal masks as specified in clause 1.4.3.6.

**Note:** The intention of providing a dustproof cavity is to obviate regular cleaning of the reflector and the interior surface of the lens.

#### 1.4.3.5 *Transformers*

Each lamp shall be energised from a separate isolating transformer complying with AS 3108. Transformers shall be accommodated within the lantern body.

The requirements for each transformer shall be as set out below:

- (a) input to primary winding - 240V 50Hz nominal
- (b) magnetising current - 40 mA maximum
- (c) secondary winding output - shall be as indicated in the following table for 240V input:

Lantern Size (mm)	Resistive Load (Watts)	Output Voltage	
		Minimum	Maximum
200	50	9.40	9.90
300	50	9.95	10.02

**Note:** Voltages measured approximately 5 minutes after switch-on with the indicated load.

- (d) winding temperature rise - shall not exceed 40°C at 50W loading.

**Note:** Temperature rise is to be calculated by resistance method.

- (e) maximum operating temperature - when installed in a lantern and connected to a 50W lamp load, the transformer shall be suitable for continuous operation when the ambient temperature is 45°C (refer clause 4.7 of AS/NZS 2144: 2002).

**Note:** The temperature inside the lantern, where the transformer is installed, will be considerably above 45°C owing to the heat generated by the lamp and the effect of insulation.

- (f) special operating conditions - refer clause 5.4 of AS/NZS 2144: 2002. In addition, the transformer shall operate without detrimental effect if the primary voltage is reduced by phase-shift control from 240V down to 215 VRMS (60 degrees triggering angle).
- (g) electrical protection - the transformer connections and terminations shall be insulated and mechanically protected to provide safe working conditions for unskilled personnel engaged on lamp replacement.
- (h) environmental protection - vacuum impregnation to Class H (180°C IEC 85) or better.

#### 1.4.3.6 *Masks*

Symbolic displays referred to in AS/NZS 2144: 2002 shall be generated using metal masks. When fitted, the mask shall be firmly held against the inside surface of the lens, to ensure that it does not move or change its orientation during normal service.

The method of fitting and retaining the mask shall be such as to ensure that the optical cavity remains dustproof when the mask is in place.

#### 1.4.4 **LED Lanterns**

This specification covers both new complete lanterns and individual retrofit aspects to be installed in existing lantern bodies.

All LED lanterns and retrofit aspects **must** comply with AS/NZS 2144:2002, have RTA Type Approval and have an independent NATA certified laboratory report confirming compliance with AS/NZS 2144:2002.

(REV 2)

##### 1.4.4.1 *LED Retrofit Aspects*

The retrofit aspect shall be a single, self-contained unit designed to fit into the existing lantern without modification to the lantern body.

The unit shall fit securely into the lantern body and have a minimum weatherproof rating of IP65 protecting all internal LED's, and electronic or electrical components from the intrusion of dust and moisture. The external face of the lens shall be smooth to restrict the build-up of material that may dull the brightness of the aspect.

The 230V power supply shall be current regulated and be contained within the LED unit and shall connect directly into the existing electrical wiring.

#### 1.4.5 **Lantern Body Construction**

Lantern bodies shall be constructed from either cast aluminium alloy or polycarbonate plastic. 300mm vehicle lanterns may be constructed from sheet aluminium. The type of construction shall be specified in the Special Conditions to this Specification. All lanterns are to comprise individual aspects connected together to make a display.

(REV 2)

The M12 mounting studs shall be locked to the lantern body such that they are prevented from turning if a torque of 25 Nm is applied externally.

The lantern doors shall be capable of being hinged both left and right without the need for tools. It shall also be possible, as a simple field procedure, to replace any door without the need to disturb the lantern mountings.

## 1.5 Visors (Cowls) and Louvres

Each visor shall fit tightly against the door and shall not permit any perceptible filtration of light between the door and the visor. The construction and dimension of visors shall comply with AS/NZS 2144: 2002 and shall be fully interchangeable in accordance with the criteria recommended in Appendix F of AS/NZS 2144: 2002.

A visor shall be fitted to each optical system of each signal lantern and shall be one of the following:

- (a) **Open Type Visor:** For use on primary lanterns. Such visors shall extend a minimum of 200 mm from the lantern face and shall be so constructed that the face of the lantern is shielded from sunlight without unduly obstructing the driver's view of the aspect when at the stopline. (REV 2)

This will require a visor enclosing about two-thirds of the lens at the end adjacent to the lantern and, about one-third of the lens at the end of the visor furthest from the lantern.

- (b) **Closed Type Visor:** For use on secondary or tertiary lanterns. Such visors shall extend a minimum of 200 mm from the lantern face and shall enclose the whole of the circumference of the lantern lens except for an opening at the bottom. (REV 2)

Both of the above types of visors shall be constructed so that they are cylindrical in shape to facilitate the fitting of louvres.

- (c) **Pedestrian Visor:** Each pedestrian lantern shall be fitted with an approved rectangular visor.
- (d) **Louvres:** When specified, louvres complying with the dimensions shown in Figure 7.10 of AS/NZS 2144: 2002 shall be fitted to the visors.

## 1.6 Target Boards (Backing Boards)

Target boards shall be fitted to each vehicle lantern supplied. The size of target boards shall be as specified in AS/NZS 2144: 2002 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/NZS 2144: 2002. The surface treatment shall be baked enamel (black).

Target Boards for 200 mm lanterns shall incorporate a 20 mm white painted border around the outside as set out in Clause 7.9 of AS/NZS 2144: 2002.

Target Boards for 300 mm lanterns shall incorporate a 35 mm white baked enamel border.

## 1.7 Poles (Posts)

All poles shall comply with the dimensions shown in the drawings in Appendix A.

The contractor shall supply, at the time of tender, a **Design Certificate and a Certificate of Compliance from a suitably qualified Engineer** for each pole type to be supplied, except standard 5 metre poles. The Certificate of Compliance shall include the foundation details.

## 1.8 Pedestrian and Cycle Detection

All pedestrian and cycle detection and related equipment must have prior approval from the Engineer.

### 1.8.1 Pedestrian Push Button Assemblies

Pedestrian push-button assemblies shall contain audio and tactile facilities and shall comply with AS 2353-1999 "Pedestrian Push Button Assemblies". In addition the following requirements, shall be met:

- (a) The push button switch shall be a suitably rated micro switch complying with the requirements of AS 2353-1999 Clause 2.3.3.
- (b) The visual pedestrian demand indicator is not required.
- (c) An audible "WALK" signal complying with AS 2353-1999 shall be emitted from the push button assembly for the whole of the walk period or 60 seconds, whichever is the lesser.

- (d) An audible “CALL ACCEPT” signal shall be emitted from the push button assembly no more than 200 ms after the button is pushed, but only if the demand is accepted or a current demand exists. The signal shall be a double pulse with the first pulse having a length of 25 ms +/- 5 ms and a tone of 1250 Hz +/- 50 Hz, followed, after 100 ms of silence, by a second pulse having a length of 25 ms with a tone of 1000 Hz +/- 50 HZ. The time between successive CALL ACCEPT signals must not be less than 1.8 sec from the time the button is pressed.
- (e) A vibrating tactile “CALL ACCEPT” shall be provided. This shall consist of a “locating signal” pulse followed 100 ms later by another “locating signal” pulse.
- (f) The audio and tactile drivers and related equipment need not be part of the push button assembly but, where separate, should be mounted in the pole-top assembly. If this is not possible, then it should be mounted in the pedestrian signal on the same pole as the push button assembly.
- (g) The push button assembly shall be supplied with enough cabling to allow installation in 5.1 m signal poles.
- (h) The push button assembly shall incorporate an ambient noise control device as detailed in AS 2353-1999, Clause 3.4.3.

### **1.8.2 In Ground Pedestrian Assemblies**

In Ground Pedestrian units shall have a minimum dimension of 900 mm by 600 mm and their installation shall comply with the recommendations of *RTS 14 – Guidelines for Installing Pedestrian Facilities for People with Vision Impairment*.

The detection output must be compatible with the standard inductive loop detector unit technology.

They shall be made from colour fast material and be capable of withstanding vehicle loadings.

### **1.8.3 Cycle Push Button Assemblies**

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

- (a) They shall be coated blue.
- (b) The micro switch and wiring are not required where a cycle loop exists
- (c) The audio and tactile facilities are not required.
- (d) The embossed arrow disc shall be replaced with a red lens similar to a vehicle signal lens and embossed with the cycle symbol.
- (e) They shall incorporate a purpose built reflector, lampholder and 20 watt quartz-halogen lamp, wired back to the signal controller, to display a call accept signal.

### **1.9 Vehicle Loop Detectors**

Vehicle Loop detectors shall comply with AS 2703:1987 “Vehicle Loop Detector Sensors”. Unless specifically requested all detector units offered for supply shall be mounted within the traffic signal controller logic module.

### **1.10 Labelling and Marking**

All switches, indicator lights, push buttons, fuses, cable sockets and plug-in components shall be neatly and clearly marked to indicate their function and/or what is connected. Multi-position switches shall show “ON” and “OFF” positions where applicable, and selector switches shall be provided with calibrated dials clearly marking each position.

The Engineer must approve the method of labelling selected. Where not specified, the Contractor shall confer with the Engineer regarding the selection of suitable wording and the size and position of the labels.

### **1.11 Instruction Manual**

If requested the Contractor shall supply, within 15 days after the installation or delivery of the equipment in accordance with this specification, a copy of the Instruction Manual. All printed matter is to be in the English language.

The Instruction Manual shall be sufficient to allow the operation of the unit by traffic engineering staff. It should include:

- (a) A description of the unit supplied and a description of options available to increase the capability of the unit.
- (b) A description of the displays provided by the unit and the means of data entry.

#### **1.12 Documentation**

The Contractor shall provide two hard copies of the Intersection Layout Sheet, Cable Termination Chart and the Controller Information Sheet (CIS) no later than two weeks after commissioning the equipment. An electronic copy (eg CAD or Excel files) of these records shall also be provided to the Engineer.

One hard copy shall be laminated, to protect against weather and vermin, and placed in the document rack within the controller cabinet. The preferred size of the hard copies is A4.

The recommended formats for the Intersection Layout Sheet and Cable Termination chart are shown in Appendix B.

In addition a controller logbook shall be provided within the controller cabinet.

#### **1.13 Compliance with Supply Authority's Regulations and the Electrical Wiring Regulations**

All equipment shall satisfy the requirements of the Electrical Wiring Regulations AS/NZS 3000 (and any amendments) and the Local Power Supply Authority. The equipment shall be approved by the Local Power Supply Authority.

Any communication equipment likely to be connected to the Telecom network shall be Telecom approved.

#### **1.14 Testing of Equipment**

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

## SECTION 2

### INSTALLATION AND COMMISSIONING OF TRAFFIC SIGNAL EQUIPMENT

#### 2.1 Scope

This Section of the Specification covers the installation and commissioning of signal equipment including the controller, cabinet, vehicle and pedestrian signals, call boxes, detection equipment and detector loops. It also covers the painting of equipment.

#### 2.2 Temporary Traffic Management

The contractor shall be responsible for the supply and erection of all necessary barricades, warning notices, lights, etc, as required under Section 5.7.2 of NZS 3910: 2003 Conditions of Contract for Building and Civil Engineering Construction and as required by the Transit New Zealand Code of Practice for Temporary Traffic Management or to any other specific documents that may be provided by the RCA / Client.

The contractor shall obtain from the RCA whatever approvals required to be able to work on the roadway under the RCA's control. Such approvals may include a documented Traffic Management Plan.

#### 2.3 Supply of Electric Power

The contractor shall be responsible for arranging, with the Road Controlling Authority's power supply company, for 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 and shall get all necessary permits and shall provide a copy of the Certificate of Compliance to the Engineer on completion of the works.

#### 2.4 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.

#### 2.5 Pole Top Cable Terminations

The multicore cables, referred to in Clause 3.5.1, shall be brought up the interior of the signal pole or mastarm and terminated on the special terminal assembly (see Clause 2.11). 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 35 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 Clause 3.9), 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 say will always terminate into terminal 6. (REV 1)

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. The cores of different cables shall not be laced together in the same loop.

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.

#### 2.6 Earthing (Bonding)

All metal components must be individually earthed in accordance with the AS/NZS 3000:2000 wiring regulations, using a minimum size earthing cable of 4.0 mm<sup>2</sup>. Particular attention should be given to poles (including mastarms), callboxes, finial caps, metal bodied signals, controller and cabinet, mastarm termination box and audio tactile driver box.

## 2.7 Cable Termination Chart

For all new installations, a cable termination chart (eg as shown in Appendix B) shall be completed prior to termination of cables onsite and supplied to the Engineer.

At existing sites the contractor shall amend the existing cable termination chart supplied by the Road Controlling Authority. 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 must comply with the details of the cable termination chart.

## 2.8 Controller Cabinet

The controller cabinet shall be securely fixed to a concrete foundation or preformed base with, at minimum, four M16 hot dipped galvanised bolts 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 must be supplied to the Engineer for approval.

The access between the controller base and the cabinet shall be made vermin proof. This shall be achieved by the use of a gland plate and cables must enter the cabinet through the use of sealed glands. The gland plate must be sectioned such that one section can be removed to access the ducts in the controller base without disturbing the cabling.

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 600mm on the side adjacent to the door. The apron shall be installed to provide drainage away from the controller to the adjacent ground but to maintain a comfortable working platform.

## 2.9 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 and as set out in Clause 3.9.

All field wiring terminals in the controller cabinet shall be vertically mounted with one unit servicing four signal groups. 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 terminals designed for 2.5mm<sup>2</sup> cable. The terminal rail shall be long enough to hold enough terminals for four signal groups. (REV 2)

Both terminals and signal groups shall be counted and labelled from the bottom up in the order: grp 1 green, grp 1 yellow, grp 1 red, grp 2 green, grp 2 yellow, grp 2 red etc. Group 1 to 4 shall be on the right-hand side.

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

An additional non-switched terminal unit shall be provided 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 GP phase (wired through the GP circuit breaker), detector returns, pedestrian buttons, special inputs and outputs etc. The earth and neutral terminals replace the old earth and neutral bars that are now reduced in size and contained within the proprietary switchboard.

These terminals shall be grouped together with the earth and neutral at the bottom, then any 230V supplies and then the low voltage supplies at the top. A terminal separation plate shall be provided between the earth and neutral terminals and between the 230V and low voltage terminals. The terminal rail shall be long enough to hold 20 terminal blocks.

Each terminal shall be clearly labelled with its function using labels supplied by the terminal manufacturer.

## 2.10 Vehicle Detectors

For all new signal installations the detector equipment shall be located in the controller cabinet. Each detector channel shall be clearly labelled with the on-street detector number.

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 equipment to poles on medians or small islands shall be avoided as far as practicable. Pole-mounted detector equipment shall be mounted in an unobtrusive manner and such that convenient access can be obtained to it from a ladder placed on the footpath.

For all detectors that are mounted external to the controller, the power supply for the detectors 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 allow easy isolation of the loop/loop feeder side of the circuit for testing purposes. The terminals must 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.

## 2.11 Pole Terminal Assemblies

The top of each standard pole shall be fitted at the upper end with a terminal assembly unit and cover meeting the requirements of AS 2339-1997 "Traffic Signal Poles and Attachments". For mastarm poles a terminal assembly unit and cover shall be mounted on the top section on the mastarm that supports the lanterns. The terminal cover or finial cap shall fit snugly over the pole top to minimise the ingress of water, dirt and grime. Metal finial caps must be **separately earthed (bonded)**. The pole top terminal assembly must be designed to provide for the mounting of the signal lanterns.

In addition, mast arm poles shall have a terminal assembly box fitted to the pole, mounted no lower than 3.5 metres above ground level, for termination of low level lanterns. The box shall be a standard waterproof type with minimum dimensions of 305 mm x 160 mm x 160 mm and be made of aluminium or polycarbonate box and have rating of IP65. The terminal assembly box shall be fixed to the pole with a minimum of two M6 bolts and shall have a rubber seal or gland between the box and the pole metalwork to create a waterproof seal. All signal leads shall enter through the underside of the box. (REV 2)

All cables shall be terminated in accordance with the details shown on the Cable Termination Chart.

### 2.11.1 Switch Terminations

The terminals shall be rail mounted, screw clamp type capable of accepting conductors with cross-sectional areas from 0.5 mm<sup>2</sup> to 2.4 mm<sup>2</sup>, having double/multiple compression clamps (two outputs either side of the switch). The terminal block shall be of switch connection type, by short blade which is removed when the circuit is opened, compliant with IEC 60947-7-1 and equipped with two 20 test socket screws IEC voltage rated 320V, pulse 4KV current 10A. (REV 2)

### 2.11.2 Neutral Terminations

The terminals shall meet the requirements of Clause 2.11.1 excepting that they shall not use switch terminations.

### 2.11.3 Earth Terminations

The earth bus bar shall provide ten outputs with connectable cross-sections measuring 10 mm<sup>2</sup> and 16 mm<sup>2</sup> configured alternately. The bar shall be rail mounted and have a rated voltage of 450V and be rated IP20. The insulating material shall meet the reference standard IEC 60998-1 and IEC 60998-2-1.

## 2.12 Signal Lanterns

### 2.12.1 Lantern Mounting Supports and Straps

Upper and lower mounting supports shall be provided on each signal pole. Pedestrian lanterns shall have their own separate set of supports mounted below the vehicle lantern supports. All mounting hardware must be hot dipped galvanised.

Pole top mounting assemblies or top mounting lugs must have a fixed mounting stud.

All signals attached to pole top assemblies must 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 the relevant clauses of AS 2339 - 1997 – “Traffic Signal Posts and Attachments” and in particular the following strap thicknesses shall apply: -

Strap Length	Strap Thickness
150	3mm
250	5mm
400	6mm

(REV 2)

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

All nut and bolt assemblies shall be provided complete with locking washers complying to Appendix C of AS 2339 –1997.

### 2.12.2 Lantern Leads

- (a) Each signal lantern shall be supplied with leads at least 750 mm long and shall be fitted with at least 450 mm of nominal 15 mm flexible PVC hose.
- (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 installed, the 15 mm flexible PVC hose shall not extend down below the halfway point of the lantern, when hanging freely.

### 2.12.3 Siting of Signal Lanterns

#### (a) Siting and Alignment

Each lantern shall be sited and aligned in accordance with “*Guide to Traffic Engineering Practice: Traffic Signals Third Edition*” Austroads 2003 (Austroads Part 7) and as set out in Appendix 1, Drawing NTS 1 “Signal Lantern Alignment”.

#### (b) Lantern Mounting Height

All vehicle lanterns shall have a mounting height of 4.1 m. Pedestrian lanterns shall be mounted in accordance with Section 7.5.4 of the “*Guide to Traffic Engineering Practice: Traffic Signals Third Edition*” Austroads 2003 (Austroads Part 7).

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

### 2.12.4 Covering of Lanterns

Complete shrouding of lanterns must be carried out to completely obscure vision of lanterns at all times during installation. Where commissioning will take place within one day of lantern installation, the Engineer may allow a dispensation from this clause but otherwise shrouding shall be necessary for the full period from installation until commissioning.

### 2.13 Inductive Loops

Detector loops shall be positioned so as 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 figure 2.3 below.

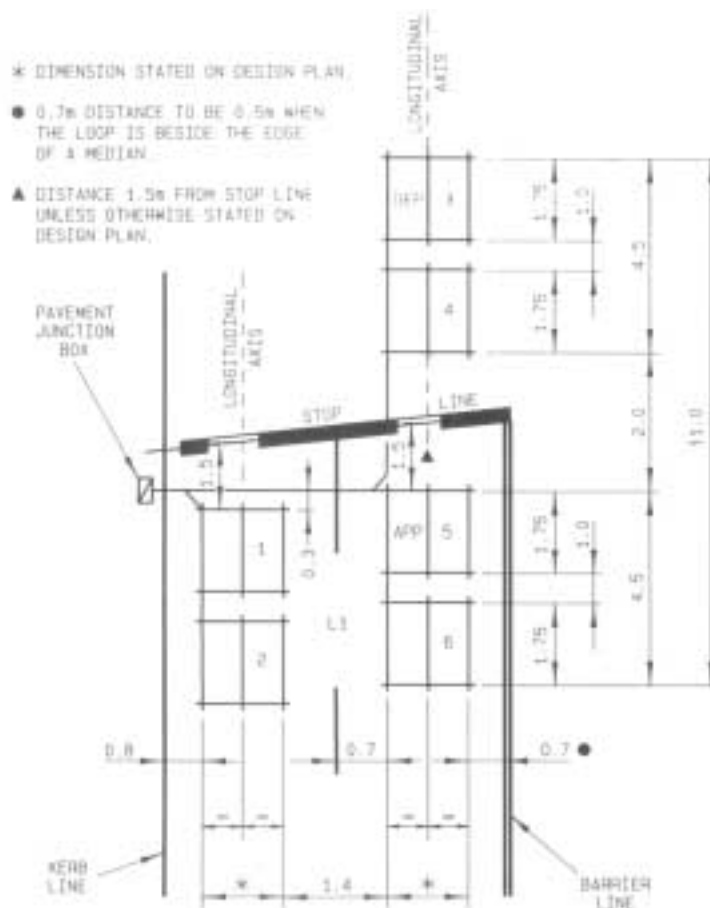


Figure 2.3  
 LOOP LAYOUT FOR STOP-LINE DETECTORS  
 AND NUMBERING OF LOOP CABLES IN PJB

The Contractor shall mark the required position of detector loops 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 feels that the conditions are not satisfactory they shall notify the Engineer before installing the detector loops.

Detector loop wire shall consist of single core polypropylene insulated cable with a nominal cross-sectional area of 1.5 mm<sup>2</sup>, and shall comply with AS/NZS2276.3: -2002 “Cables For Traffic Signal Installations, Part 3 - Loop Cable for Vehicle Detectors”. The cable shall be laid in one continuous un-jointed length, laying it twice around each loop as shown in Figure 2.7 below. Tails for up to two loops can be laid in the same slot if required. (REV 2)

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 must be at least 300mm 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. (REV 2)

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 Figure 2.7 below. Prior to sealing the slot, the loop shall be tested to ensure the insulation or wire is not damaged. The loop should have a resistance to earth of not less than 10 mega-ohms.

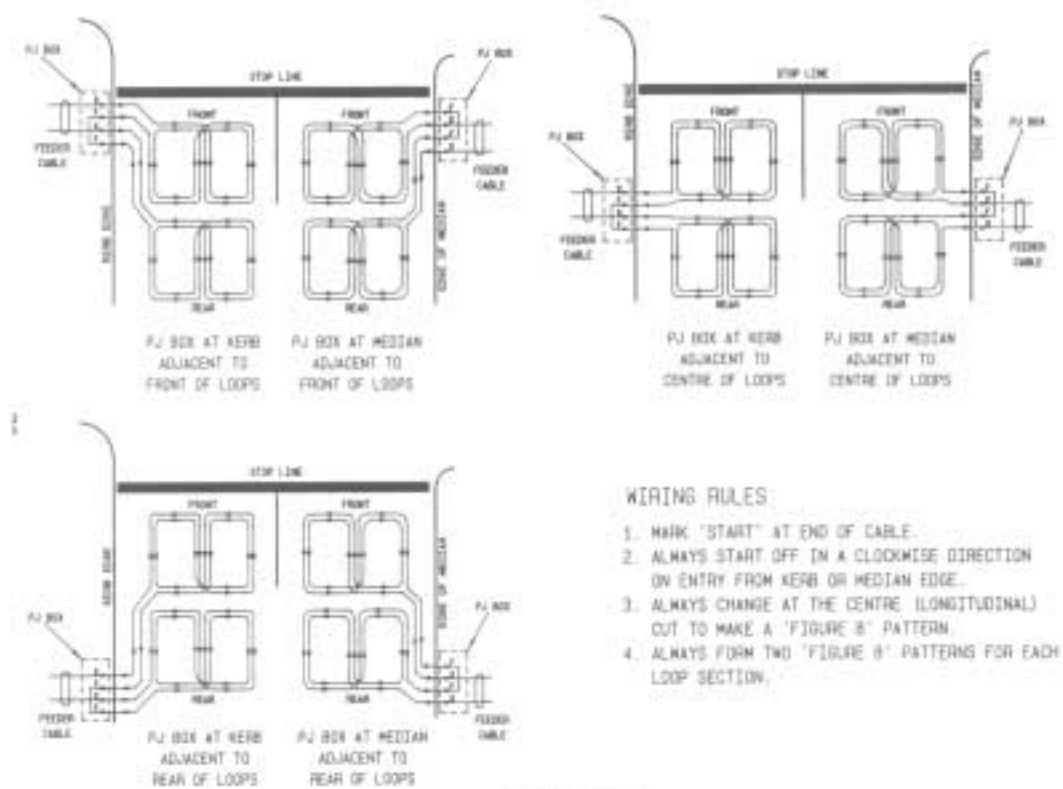


Figure 2.7

## SYMMETRIPOLE TYPE LOOP DETECTOR WIRING &amp; CONNECTIONS

The loop wire slot shall be sealed with Tixophlate or an approved equivalent 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. Sealing shall be done within two hours of saw cutting the loop.

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 the kerb side junction box using Scotchlok 314 connectors or similar approved.

**Note:** Due to noise and/or traffic flow conditions the RCA / Client may restrict the time at which detector loops may be installed.

## 2.14 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 *RTS 14 – Guidelines for Installing Pedestrian Facilities for People with Vision Impairment* (i.e. the pedestrian assembly shall be located so that the front of the assembly is perpendicular to the pedestrian crossing lines and so the arrow disc will always be orientated so that the arrow is pointing straight up).

On medians, the assembly shall be orientated parallel to pedestrian lines. The arrow disc will therefore always be orientated so that the arrow is pointing parallel to the ground).

The cycle assembly shall be located so that the front of the assembly is parallel with the kerb. Note that wiring for the call-accept is required for cycle call boxes.

## 2.15 Painting

Painting of signal poles and equipment shall be as follows:

### (a) General

All paints shall be applied in strict accordance with the manufacturer's recommendations.

No painting shall be carried out in wet, foggy, frosty, or dusty weather.

Painting and surface preparation shall conform to the relevant clauses of NZS 7703:1980 Guide to the Protection of Iron and Steel Against Exterior Atmospheric Corrosion.

The colour yellow described in this specification shall be as specified in the Special Conditions to this Specification. The colour blue described in this specification shall be Dulux "True Blue" shade 2821 or equivalent. (REV 2)

The painting of signal mast arm poles (and other non signal poles supporting signal equipment) shall consist of painting that part of the pole below the level of the top vehicle lantern mounting bracket. The remainder of the pole is to be left unpainted.

(b) **Surface Preparation**

Surface preparation shall vary according to the conditions of the signal components.

All surfaces shall be thoroughly cleaned of all deposits, including dirt, oil and grease. New galvanised steel shall be rubbed down with mineral turpentine or other suitable solvents.

Where the existing paint system is all or partially intact, the preparation shall consist of thorough wire brushing and rubbing down to remove all loose and flaking paint to present a surface suitable for subsequent undercoating.

Where rusting is evident, thoroughly wire brush and emery-buff the work to expose a surface satisfactory for spot priming.

(c) **Primer/Undercoat**

Within two hours of preparation, prime/undercoat all surfaces to be painted with the approved etching primer/undercoat specified in the Special Conditions to this Specification, to achieve the minimum dry film thickness specified by the paint manufacturer. (REV 2)

(d) **Topcoats**

Apply two full coats of the topcoat specified in the Special Conditions to this Specification to achieve the minimum dry film thickness per coat specified by the paint manufacturer. Re-coat within the time specified by the paint manufacturer. (REV 2)

(e) **Thickness Testing**

The Engineer will carry out paint thickness testing. Any areas under the specified thickness shall be built up to meet the minimum requirements. Thickness testing will be adjusted to account for the average thickness of existing paint.

(f) **Painting Schedule**

<i>Poles</i>	Gloss yellow to the pole top or as specified in the Special Conditions to this Specification. (REV 2)
<i>Lanterns:</i>	<ul style="list-style-type: none"> <li>- Signal face</li> <li>- Signal housing</li> <li>- Target boards</li> <li>- Signal visors</li> </ul>
	<ul style="list-style-type: none"> <li>gloss black</li> <li>gloss black</li> <li>flat black</li> <li>flat black internally</li> <li>gloss black externally</li> </ul>
<i>Illuminated Signs</i>	
	<ul style="list-style-type: none"> <li>- Sign face</li> <li>- Sign housing</li> <li>- Sign visors</li> </ul>
	<ul style="list-style-type: none"> <li>gloss black</li> <li>gloss black</li> <li>flat black internally</li> <li>gloss black externally</li> </ul>
<i>Pedestrian call boxes</i>	gloss black

*Cycle call boxes*

gloss blue

*Other Items* (pole caps, detector boxes etc)

gloss yellow or as specified in the Special Conditions to this Specification.

## **2.16 Special Tools and Keys**

The Contractor shall supply to the 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 Road Controlling Authority.

## **2.17 Acceptance and Testing**

### **(a) General**

On completion of the work, the equipment is to be left clean, free from dirt, dust, paint blemishes, etc. All services, equipment and fittings shall be in proper working order and in good condition in accordance with this Specification.

### **(b) Tests Before Commissioning**

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 "*Guide to Traffic Engineering Practice: Traffic Signals Third Edition*" Austroads 2003 (Austroads Part 7) shall be performed in the presence of the Engineer or his representative.

The Contractor shall also provide an Electrical Certificate of Compliance to the Engineer prior to the pre-commissioning check (refer clause 2.18).

### **(c) Commissioning**

When the Engineer or his representative is satisfied that the signals are installed and operating in accordance with the Specification, he will direct and supervise the commissioning of the signals.

## **2.18 Certificates of Compliance**

### **(a) General**

All new traffic controller cabinets being installed with new mains, switchboards and earthing systems will require a certificate of compliance.

### **(b) Particular Requirements**

The Engineer requires that all electrical work will be done in accordance with AS/NZS 3000:2000

The Contractor must comply with the NZ Electricity Act, in particular clauses 95, 108 and 114.

It will be the responsibility of the electrical contractor doing the signals installation work to ensure that a certificate of compliance has been obtained and the required copies delivered to the Engineer prior to commissioning of the signals.

## 2.19 Procedure for Turning Off Signals

Where it is necessary to switch a controller off, to flashing yellow or off-line, notice must be given to the appropriate Road Controlling Authority. The RCA staff must 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 must 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 must ensure that the Police control room is informed so that arrangements for alternative control of the intersection can be made as they consider necessary. Once the Police have been notified, the Contractor can proceed with turning off the signals unless specifically requested to wait for a Police presence.

When a signalised intersection is **planned** to be turned off (not flashing yellow) for more than ten minutes, the Contractor shall adhere to an approved traffic management plan (TMP) that must have already been submitted. Check also the Special Conditions for any other requirements the RCA may impose. At no time shall an intersection be left unattended with the signals off. Also, at no time shall TW2.10 signs be in place on street when the signals **are** working. (REV 2)

When there is an **unplanned** outage of a signalised intersection (eg as the result of a crash), the Contractor must immediately assess the damage and make the site electrically safe. If the signals can then be repaired and made operational (either fully or at least flashing yellow) within one 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 the Special Conditions to this Specification if operational repairs will take longer than one hour, or where work needs to occur within a live lane. (REV 2)

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 traffic management plan), 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:

- § Primary or dual primary plus secondary, or
- § Primary or dual primary plus tertiary.

The intention to operate the signals with reduced displays must be highlighted in the TMP, which should detail each approach where displays will be reduced. The Special Conditions to this Specification may set out additional RCA requirements. (REV 2)

## SECTION 3

### CABLING AND CIVIL WORKS

#### 3.1 Scope

This Section of the Specification covers the supply and installation of all cabling including multicore cable, loop feeder cable, ducting, trenching and backfilling. It also covers the installation of kerbside junction boxes poles and controller base.

#### 3.2 Cable Diagram

Cable sizes and approximate duct positions can be found on the schematic cable diagram on the Signal Drawing but the Contractor should satisfy himself that the cabling shown is totally adequate for the signals equipment depicted on the same drawing.

#### 3.3 Trenching

All trenching and restoration work shall be in accordance with the Road Controlling Authority's specification. Detailed traffic management plans must be approved before work commences.

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

The Contractor shall also inform businesses and residents likely to be affected by their work of their intended start work date at least 48 hours beforehand.

#### 3.4 Signal Duct Access Chambers

Signal Duct Access Chambers are to be provided at all 230V 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 metres clear of the carriageway. A chamber is to be provided immediately adjacent to the controller base.

Each chamber is to consist of a 600 mm diameter concrete pipe or precast chamber. Sections shall extend below the level of the intersecting ducts and be bedded on 300 mm of approved free draining compacted granular material. Chambers are to incorporate a light duty cast iron manhole cover and frame, level with adjacent finished ground surfaces and surrounded by compacted backfill to match adjacent ground densities and surface finishes. Where available, the lid should be labelled "TS" or "Traffic Signals". (REV 2)

#### 3.5 Cabling and Ducting

##### 3.5.1 Cable

All cabling shall comply with AS/NZS 3000:2000 and meet all the requirements of the local Power Supply Authority.

The multicore cable shall be purpose designed traffic signal cable externally insulated with orange PVC sheathing with the internal insulation being PVC sheathing coloured as described below. The external sheathing shall be marked to indicate its use in the installation of traffic signals. It shall be a 35 core cable having the following cable core requirements:

- 27 1.5mm<sup>2</sup> cores coloured white and consecutively numbered from 1 to 27 for signal group displays.
- 4 1.5mm<sup>2</sup> cores coloured violet, labelled "ELV ONLY" and consecutively numbered p1,p2,p3,p4.
- 1 2.5mm<sup>2</sup> core coloured black .
- 1 4mm<sup>2</sup> core coloured green/yellow for earth.
- 1 red 1.5 mm<sup>2</sup> core as a general 230v phase (eg for audio tactile, illuminated signs, cameras etc)
- 1 grey 1.5mm<sup>2</sup> core det return for push buttons

In all other respects, the cable shall comply with AS/NZS 2276.1 "Cables for Traffic Signal Installations, Part 1 – Multicore Power Cables" (REV 2)

Existing Installations - Where cable is to be replaced at existing installations similar cabling and cores as are already installed shall be used.

The cable shall be in a continuous length between poles. Joints between poles will not be accepted in new works. 1.0 metre of cable slack shall be left at the controller base and at the pole bases or in the chambers on all cable runs.

### **3.5.2 Ducting**

Ducting for all multi-core cables shall be 100 mm diameter orange PVC pipe and shall be continuous between access chambers and from access chamber to 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. The preferred method of providing the duct lines is by underground thrusting.

Cables across carriageways shall be placed in ducting after backfilling of trenches has been completed.

Ducting for loop feeder cables shall be 32 mm orange PVC pipe laid to a depth of not less than 300 mm and directly behind the kerb. It shall be continuous between the Kerbside Junction Box and the closest access chamber or pole.

Where ducting pipes need to be joined they shall be jointed with an approved PVC sealant.

### **3.5.3 Loop Feeder Cable**

Loop feeder cable shall be screened twisted pair, polyethylene insulated, PVC sheathed with a core size of not less than 1.5 mm<sup>2</sup> and shall comply with AS/NZS 2276.2 1998 "Cables for Traffic Signal Installations, Part 2 - Feeder Cable for Vehicle Detectors". The number of pairs shall be 1, 2 or 4 as specified in the schedule of quantities. A separate twisted pair loop feeder shall be provided for each detector loop and shall be laid in one continuous length (with no joints) from kerb side junction to the controller cabinet. At least 1.8 metres of cable slack shall be left at the controller base with at least 0.5 metres curled up inside the kerb side junction box.

Convention for Loop Connections - for multi-pair feeder cable, the connections shall be pair 1 connected to the kerbside detector loop with the remaining connections numbered consecutively from the kerb.

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

### **3.5.4 Mains Power Supply**

The Contractor shall be the responsible for negotiating with the local electricity network provider for the supply of a mains power cable into the signal control cabinet. The Contractor shall pay all costs (including fees) associated with this work and shall get all necessary permits.

### **3.5.5 Earthing (Bonding)**

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

### **3.6 Installation of Signal Poles and Mastarm Poles**

Signal poles shall be erected as detailed on Appendix 2. Each pole is to be plumbed vertically to a tolerance of 10 mm per 5.0-metre length.

All concrete footings shall have a 28 day compressive strength of at least 20 MPa.

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 Engineer. The Engineer must approve any changes to the designed pole positions.

Poles shall have a minimum clearance of 500-600 mm from the face of the kerb to the centre of the pole. Mast arm poles shall be erected so that there is a 5.50 m clearance to the underside of the lantern target board. Taking the road camber into account. If additional height is needed, then the arm support assembly must be lengthened.

The contractor shall confirm on site that the location of the poles meets the clearance requirements to existing electrical supply services (both underground and overhead) as set out in "NZECP 34:2001 New Zealand Code of Practice for Electrical Safe Distances".

### 3.7 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 Engineer or his representative will mark the exact position of the base on site.

### 3.8 Kerb Side Junction Boxes

Kerb side junction boxes (KJB's) shall be constructed from either plastic, cast or sheet aluminium and shall be no smaller than 300 mm x 200 mm. A firm fitting non-skid lid secured to the base shall be provided. The lid shall lie flush with the top of the box. (REV 2)

Kerb side junction boxes shall be installed at positions indicated on the drawing. The kerb side junction boxes shall be as close as possible to the back of the kerb and shall not protrude above surface level. Lean-mix concrete shall be placed around the sides to give adequate protection against accidental damage. The lean-mix shall extend to within 25 mm of the finished surface level.

Where there is no concrete kerbing present the junction box shall be located as close as practicable to the carriageway. They shall be bedded on 100 mm of free draining material and surrounded by 150 mm deep x 150 mm wide concrete haunching with the junction box lid and haunching flush with the surrounding ground level.

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

### 3.9 Labelling of Cables

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

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. An approved type is the Grafoplast Trasp System.

### 3.10 Cabling Documentation

All new or modified traffic signal ducting and cabling is required to be recorded for inclusion on the appropriate Road Controlling Authority cable diagram.

Any Contractor installing or modifying traffic signal ducts and/or cables must notify the 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 Engineer.

**SECTION 4****MAINTENANCE OF NEW WORK****4.1 Requirements for Maintenance**

All materials and equipment supplied and/or installed (including the installation) and equipment that has been modified shall be maintained for a period of time as specified in the contract documents after practical completion of the Contract. The Road Controlling Authority's current Signal Maintenance Contractor will carry out regular maintenance on the intersection and if any faulty equipment or installation work is identified, then the Contractor responsible for installing the equipment will be required to fix the fault at no cost to the Road Controlling Authority. This applies during both normal hours and after hours.

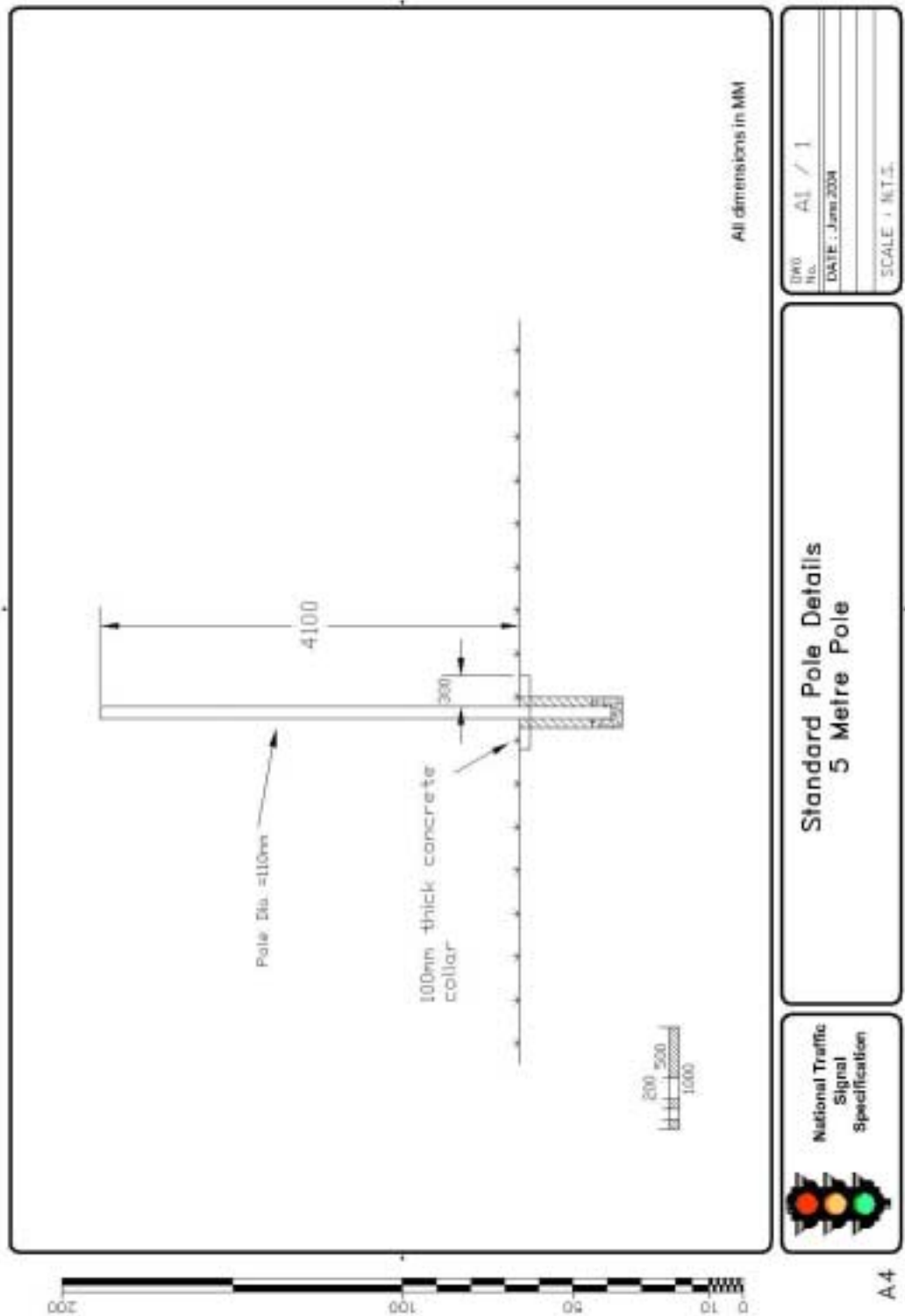
During the construction and maintenance periods, the Contractor shall also be required to pay all reasonable costs incurred by the Road Controlling Authority's Signal Maintenance Contractor (who has been contracted to maintain the overall intersection) for isolating and making safe any reported faults which can be directly attributed to the signal installation or modification work. This includes any faults in materials, equipment or workmanship. The Contractor will be invoiced separately for this work or more commonly, the amount will be deducted from the contract price or from any maintenance retentions owing.

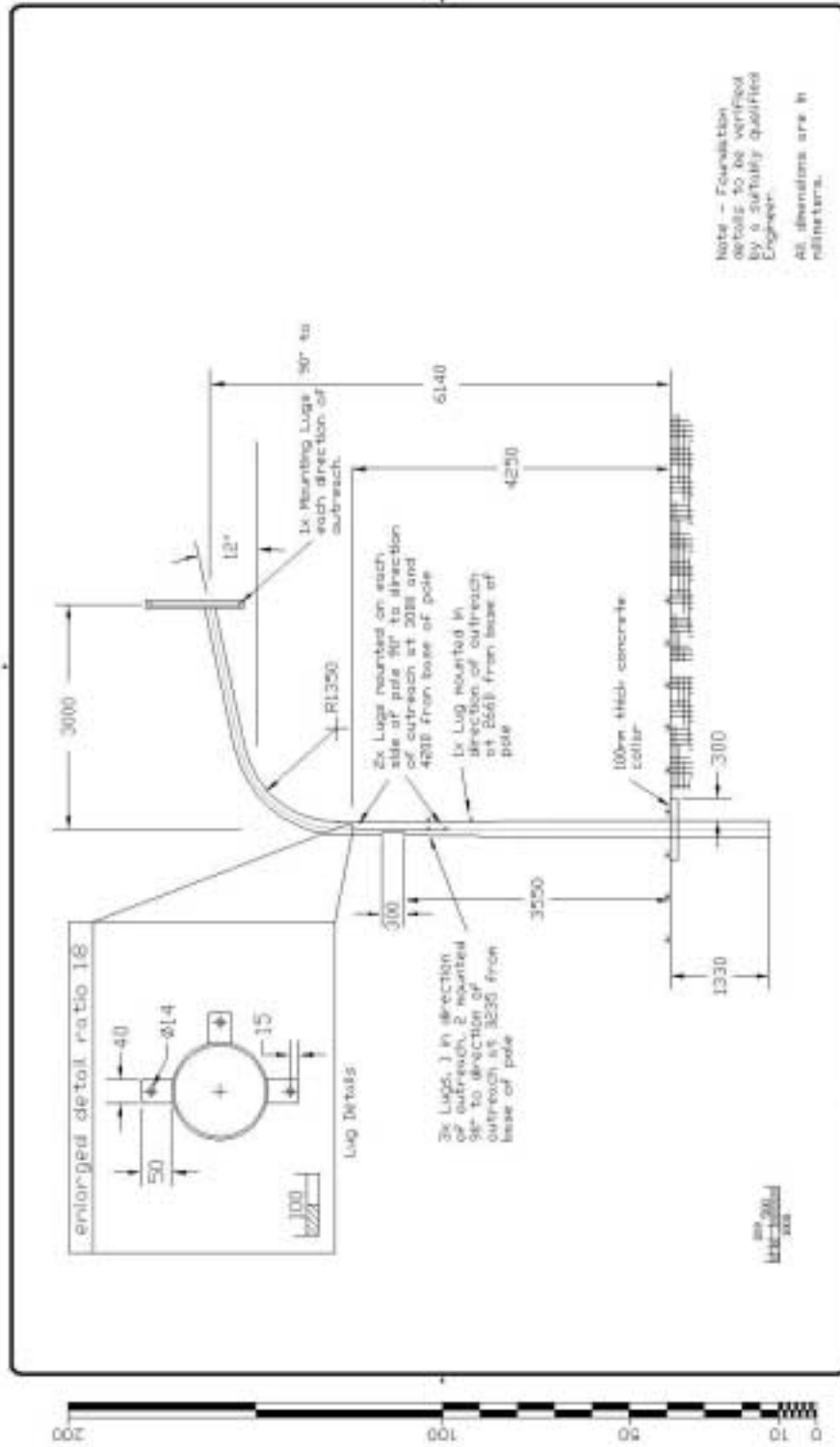
At the end of the maintenance period the equipment shall be handed over in full working order with no defects of any kind. Where such defects exist, whether in control equipment, detectors, or signal hardware or in any part of the equipment supplied, these shall be made good at no expense to the Road Controlling Authority.

Refer to the RCA's Traffic Signal Maintenance Specification for specific maintenance requirements (REV 2)

**END OF SPECIFICATION**

# Appendix A – Signal Pole Details



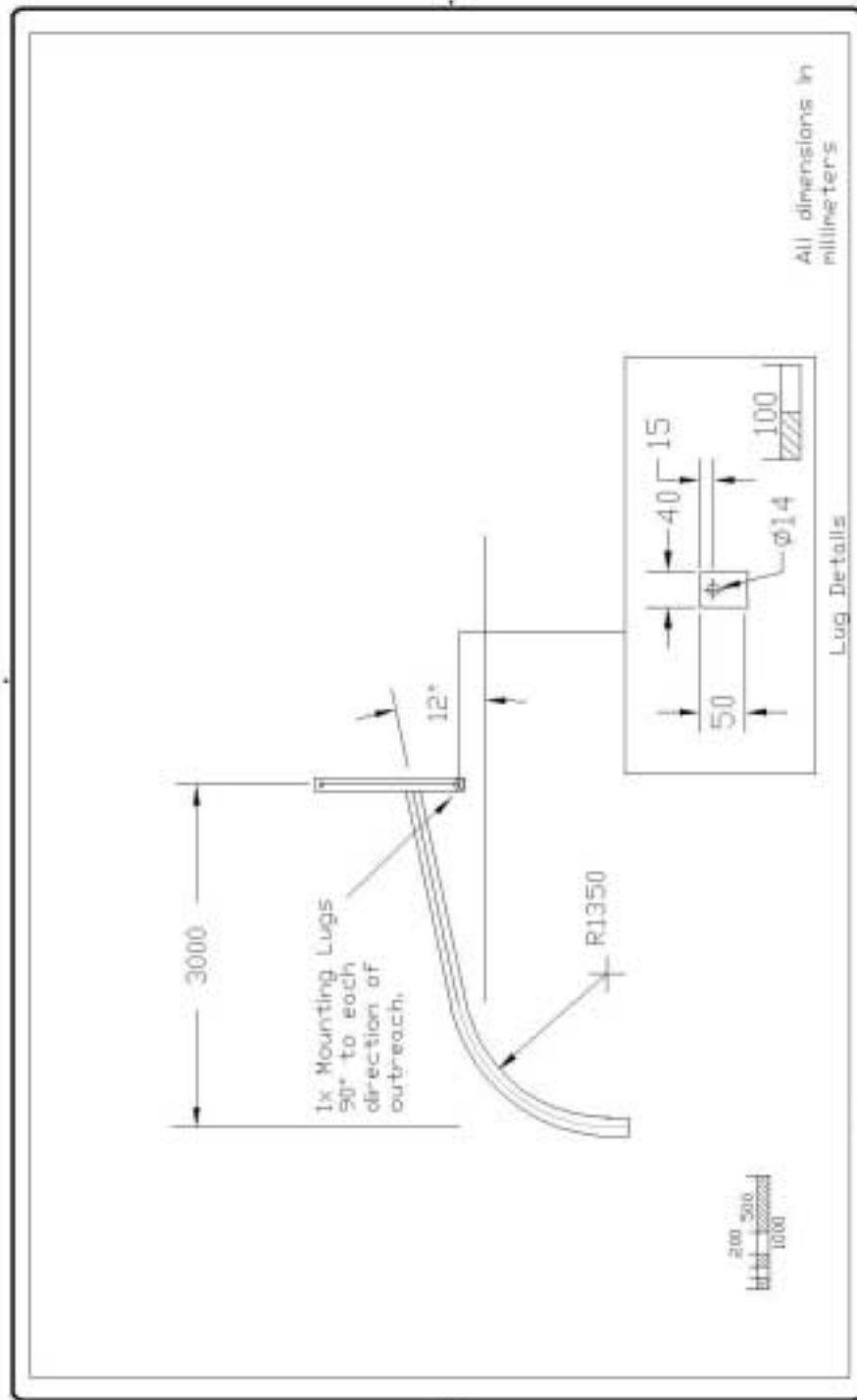


DWG No.	A1 / 2A
DATE	June 2004
SCALE	1:10

## Standard Pole Details Overhead Mastarm with 3 Metre Outreach



A.4

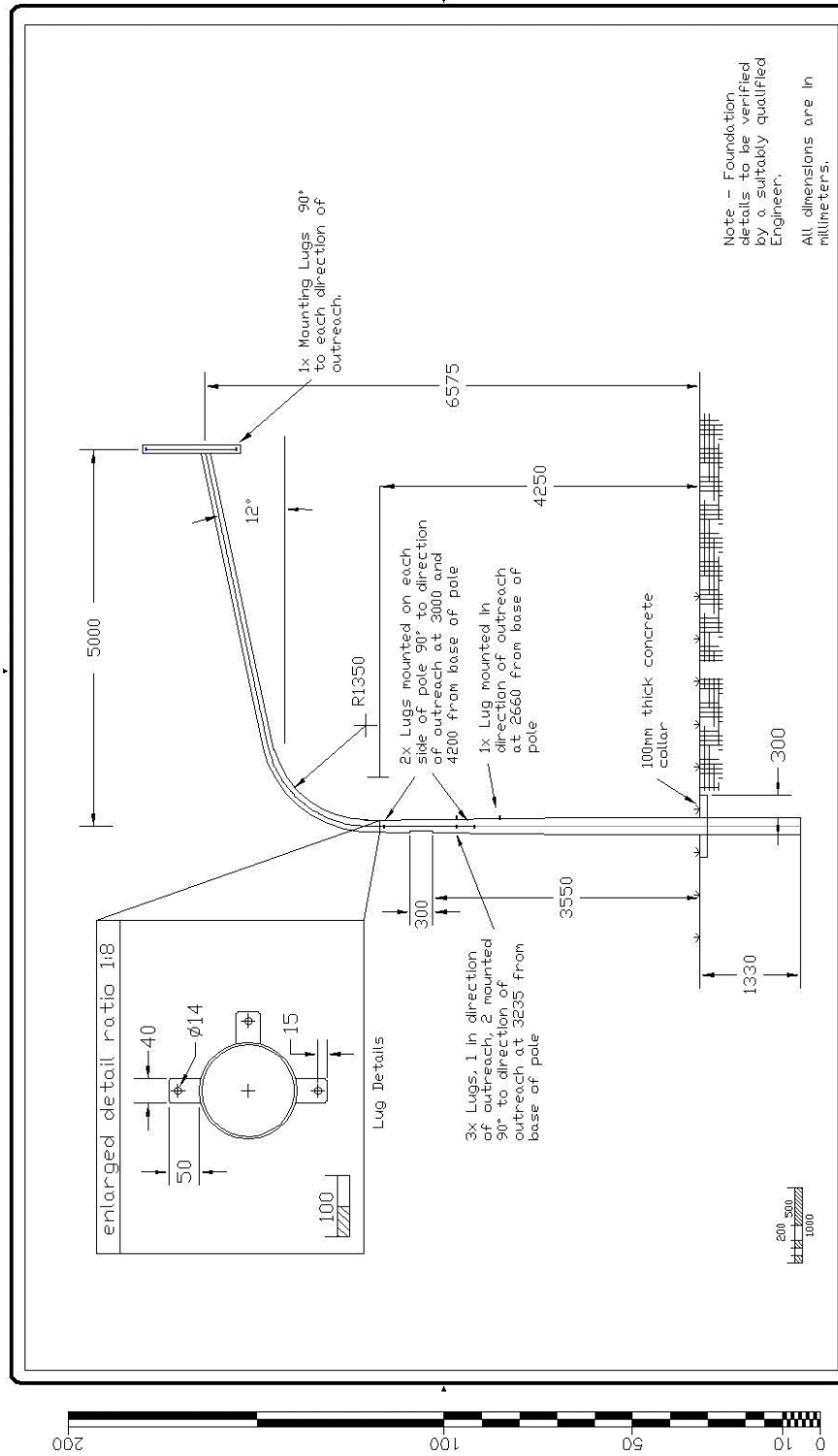


DRG No.	AI / 2B
DATE	June 2004
SCALE	N.T.S.

### Standard Pole Details 3 Metre Outreach Arm

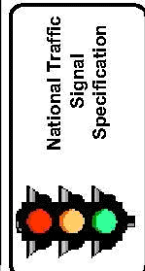


A.4

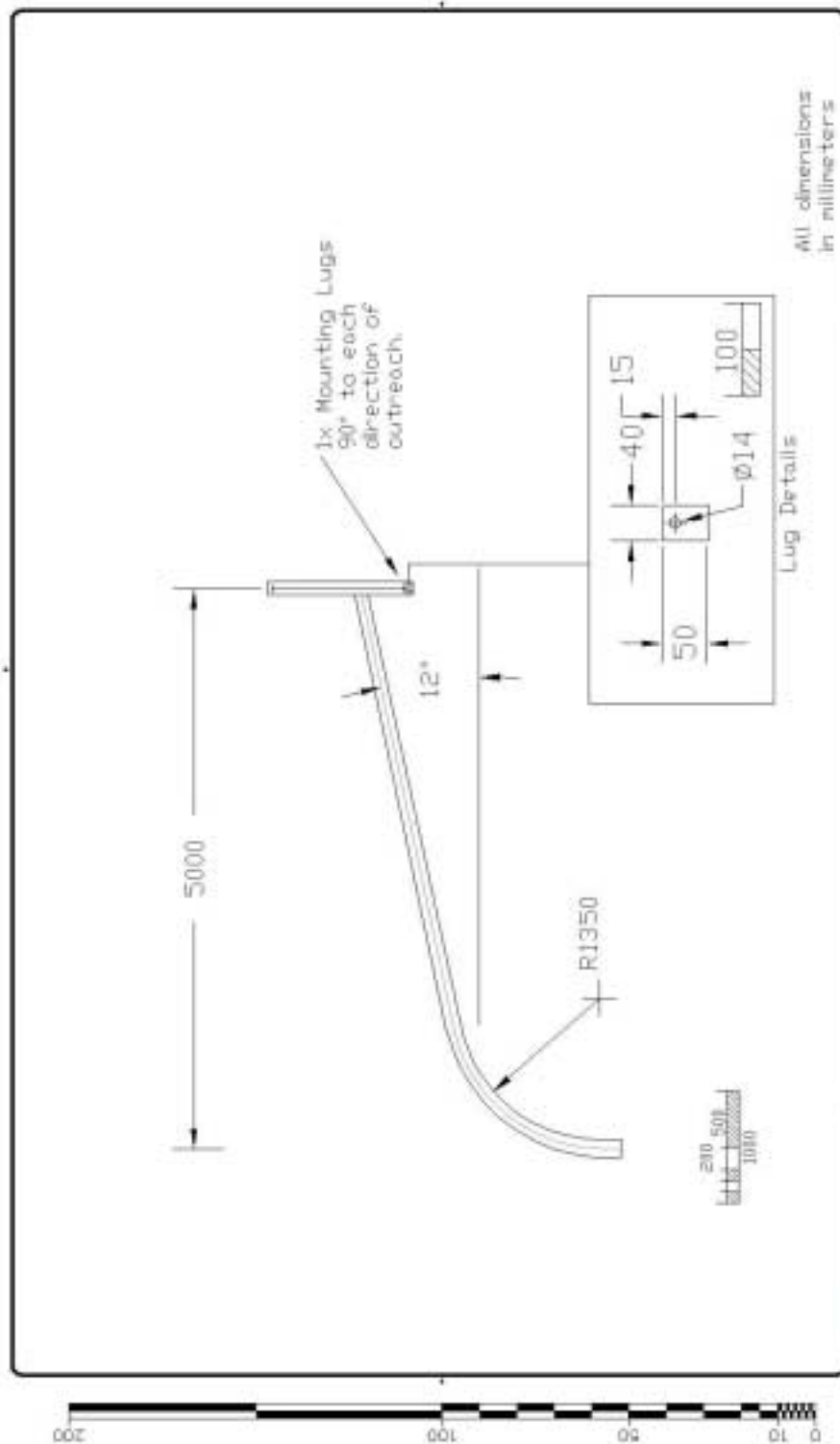


DWG No.	A1 / 3A
DATE	June 2004
SCALE	N.T.S.

## Standard Pole Details Overhead Mastarm with 5 Metre Outreach



A4



DRW No.	AI / 3B
DATE	February 2004
SCALE	N.T.S.

### Standard Pole Details 5 Metre Outreach Arm



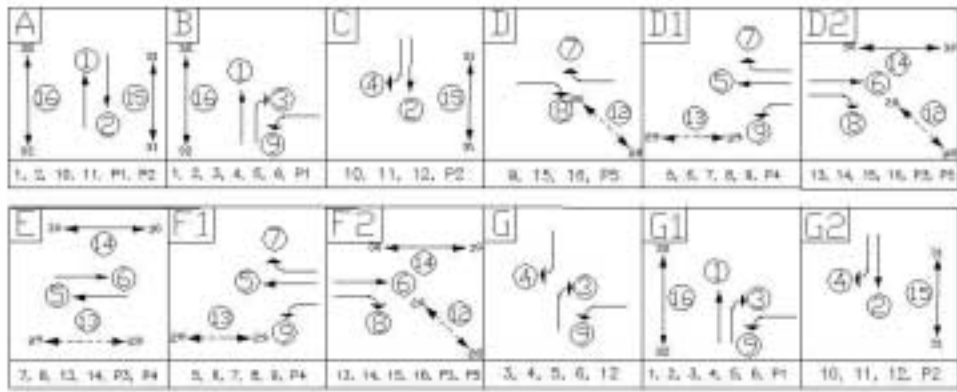
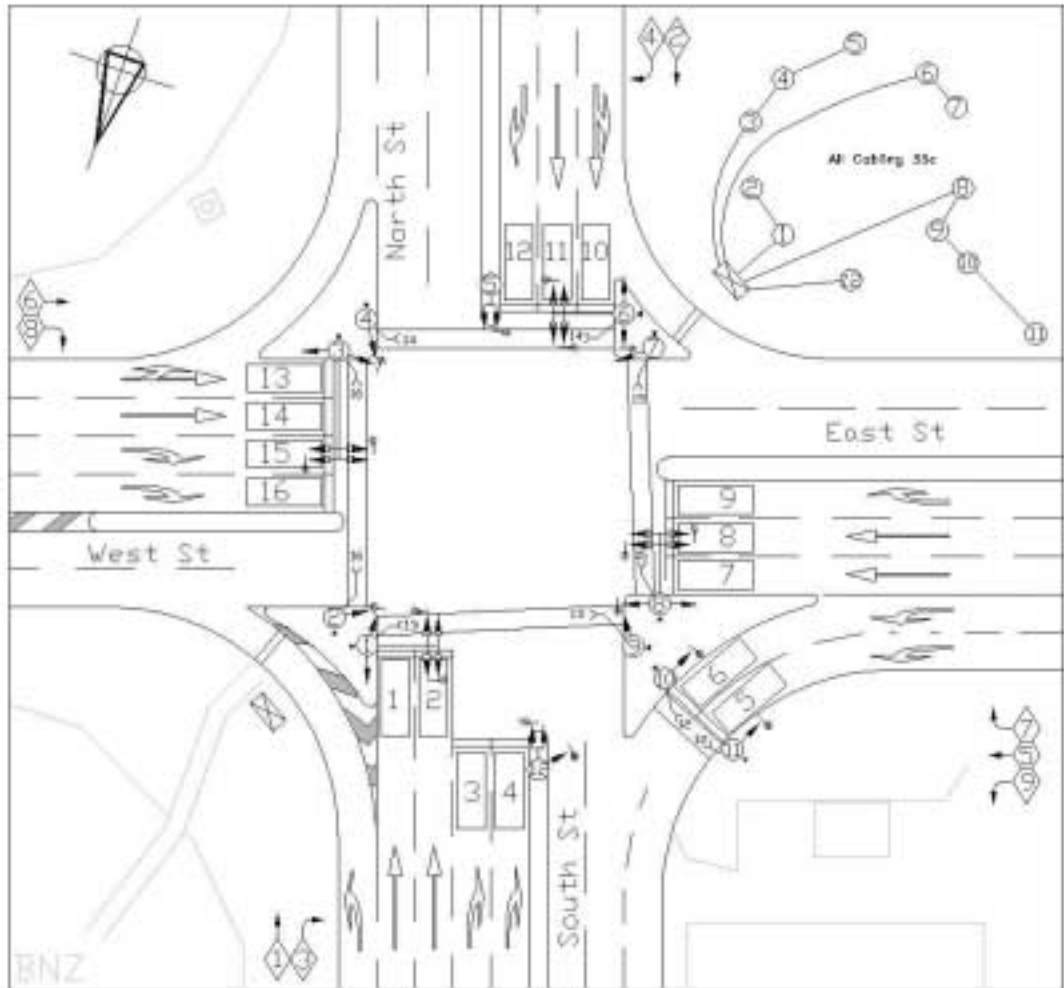
A.4







Appendix C - Intersection Layout Drawing



INT: 9999	North St / East St		
DATE : 01/09/03	Traffic Signal Layout		
Drawn By : RWT	Revision	1	N.T.S
Checked and Authorised By :			

## **Appendix D**

### **SAMPLE SPECIAL CONDITIONS TO THE NATIONAL TRAFFIC SIGNAL SPECIFICATION**

These Special Conditions must be written specifically for each Road Controlling Authority.  
The attached sample give examples of the various clauses that may need amending.

**SPECIAL CONDITIONS TO THE  
NATIONAL TRAFFIC SIGNAL SPECIFICATION**

The National Traffic Signal Specification is amended by the clauses below.  
Clause numbers refer to the clauses in the National Traffic Signal Specification.

**1.3.1.2 Controller Cabinet**

The Controller cabinet key shall be a type FS 880.  
The controller cabinet shall be painted cream, Colour - Resene Dutch White.

**1.4.5 Lantern Body Construction**

Polycarbonate lantern bodies will be acceptable.

**1.5 Visors (Cowls) and Louvres**

All visors shall be made from plastic.  
All secondary visors shall be 300mm long.

**1.12 Documentation**

The Engineer shall supply the Contractor with the latest as-built Traffic Signal Plan to be put in the controller cabinet.

**2.15 Painting**

All new poles shall be powder coated. Colour yellow shall be ORICA 33617.

**(a) General**

The colour yellow described in this specification shall be Ameron Pale Gold. The undercoat shall have a yellow base.

**(c) Primer/Undercoat**

The Primer/Undercoat to be used shall be Resene Vinyl Etch Primer (RA31)  
The Primer/Undercoat to be used shall be Ameron Undercote polyetch part A and B.

**(d) Topcoats**

The topcoat to be used shall be Dulux Acrathane IF (PC 218)  
The topcoat to be used shall be Ameron Superthane Pale Gold.

**(f) Painting Schedule**

Poles shall be painted gloss yellow to either the underside of the top pedestrian lantern mounting bracket, or the underside of the bottom vehicle mounting bracket, whichever is lower. Above this point, the pole shall be painted gloss black.

Other Items (finial caps, detector boxes etc) shall be painted black.

**2.19 Procedures for Turning off Signals**

Where there is an unplanned outage of a signalised intersection and the repairs will take longer than 1 hour, or work must occur in a live lane, the contractor must fully sign the intersection and work site as for a planned outage. It is recognised that this will necessitate the signals being off for a longer period while traffic management is arranged and set out.

Under approved temporary traffic management, it may also be acceptable to have one of the approaches with only a secondary plus a tertiary display.

**3.3 Trenching**

All trench restoration work shall be in accordance with SNZ HB 2002:2003 Code of Practice of Working in the Road, supplemented with the Christchurch City Council's Special Conditions.

Open cut trenching work shall not be carried out between the hours of 7am-9am and 3pm-6pm.