**Inspection and Test Plan – Public Lighting Electrical Installation**

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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Project no.** | | CC-0374 | **Project name** | Pakenham Roads Upgrade | | **Date** |  | | **Approved by** | Damian Hagebols |
| **ITP no.** | 1630-P200-SYM-QAC-ITP-0055 | | **Revision date** | 06/09/2023 | **Plant and equipment used** | | |  | | |
| **Lot no.** |  | | **Location (chainages, detailed description or marked up plan)** | | | | |  | | |

Attach Dockets, Certificates and QA Documents to ITP

|  |  |  | |  |  | **Verification of acceptance by** | | | | | **Remarks/record (eg. Test frequency reports, certificates, checklist etc)** |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  |  | |  |  | **Symal** | | | **Superintendent** | |
| **Item no.** | **Activity** | **Ref docs** | | **Acceptance criteria** | **Freq** | **Key** | **Resp** | **Initial/ date** | **Key** | **Sign/ date** |
| **1.0 Pre-start activities** | | | | | | | | | | | |
| **1.1** | Services | VR Clause 731.05 | | The location of all existing underground and above ground services has been proven and confirmed on site by the Contractor before commencement of any works. | Prior to start of works | H | SE/SS |  |  |  | Lot Map **□** |
| **1.2** | Check Survey Set-out | IFC Drawings | | Survey set out including frame, benchmark, and recovery points in place.  Set-out to include height of finished surface and checks to be completed to ensure pole is clear of any obstructions (such as future guardrail). | Prior to start of works | H | SE/SS |  |  |  |  |
| **2.0 Poles and Outreach Brackets** | | | | | | | | | | | |
| **2.1** | Installation of Frangible, Impact Absorbing (IA) and Slip Base (SB) Poles | VR Clause 731.06 (b)  AS/NZS 3000  IFC Drawings  Pole Manufacturer Specifications | | Frangible poles are VicRoads type approved, and conform to VicRoads Specification TCS 014 Supply of Frangible Street Lighting Poles and to drawings TC‑1064 and TC‑1065. These poles were transported to the site of the works in one piece with the base section securely bolted to the upper section.  Pole foundations were constructed in accordance with manufacturers requirements.  All frangible poles are installed in a vertical position +/- 2 degrees and in accordance with AS/NZS 3000.  All absorbing poles are installed so that the joint between pole and base is located at 75 mm ±25 mm above the finished ground surface level.  All slip planes for slip base poles are located 75 mm ±25 mm above the finished ground surface level to allow proper movement of the pole if involved in a vehicle impact.  The Contractor backfilled around the pole and reinstated the ground around the pit and pole. Where a concrete mowing pad has been formed around the pole at ground level, the Contractor ensured that the bolt heads are kept clear of the concrete. | Each Lot | I | SE/SS |  |  |  | Installation Records from Subcontractor**s □** |
| **2.2** | Installation of Outreach Brackets | VR Clause 731.06 (a)  Table 731.061 | | All outreach brackets are firmly attached to the pole spigot using the clamping bolt assembly which is supplied with the outreach bracket (refer TCS 050, TC‑1060, TC‑1061). The bracket and luminaires are aligned as shown in the road lighting design at right angles to the vehicle path on the road, and installed and plumbed the pole and luminaire(s) to within the tolerances specified in Table 731.061 | Each Lot | I | SE/SS |  |  |  | Installation Records from Subcontractor **□** |
| **2.3** | Torque | VR Clause 731.06 (d)  TCN 006 | | Slip base poles are installed in accordance with the following requirements:   1. The pole bolt and nut assembly were installed such that the nuts are placed in the upper position to enable ease of access for correct torque installation and for subsequent 30 day cycle torque maintenance checking for slip base poles only as per Work Instruction TCN 006 - Work Instruction Retighten Slip Base Pole Flange Bolts 2. The bolts and nuts have been re‑run after galvanising and are free of excess galvanising in the threads 3. The thin slip plane washer has been supplied flat and free of kinks, bends, deformation and warping - a damaged slip plane washer can result in incorrect torque and eventual pole failure and shall not be used 4. The slip-plane flange nuts have been slackened off ONE AT A TIME and re-tightened as specified in TCN 006 Work Instruction Retighten Slip Base Pole Bolts.   The torque wrench used to tighten the bolts and nuts shall have a current calibration certificate (i.e. not more than 12 months old). The Contractor shall provide a copy of the calibration test report upon request by the Superintendent. | Each Lot | I | SE/SS |  |  |  | Installation Records from Subcontractor **□**  Calibration Certificate for Torque Wrench**□** |
| **3.0 Luminaire Orientation** | | | | | | | | | | | |
| **3.1** | Luminaire orientation | | VR Clause 731.07  Table 731.061 | The Contractor installed luminaires such that they meet the mounting and orientation requirements of Table 731.061. | Each Lot | I | SE/SS |  |  |  | Installation Records from Subcontractor **□** |
| **4.0 Conduits and Pits** | | | | | | | | | | | |
| **4.1** | Conduits and Pits | | VR Clause 731.08 | Pits are generally located 1 metre in advance of, and 1 metre off the line of, each pole. A two metre spare length of each cable has been left coiled in each pit. | Each Lot | I | SE/SS |  |  |  |  |
| **5.0 Electrical** | | | | | | | | | | | |
| **5.1** | Wiring Rules | VR Clause 731.11 (a)  AS/NZS 3000 | | All electrical works, electrical fittings, materials and installations fully conform to the requirements of the latest edition of AS/NZS 3000.  Where AS/NZS 3000 did not cover a specific aspect of the electrical works (e.g. such as pits) all works were undertaken in conformance to the requirements of the Energy Safe Victoria. | Each Lot | R | SE/SS |  |  |  | Installation Records from Subcontractor **□** |
| **5.2** | Registered Electrical Contractor | VR Clause 731.11 (b) | | The electrical contractor engaged to carry out electrical works on any VicRoads road lighting installation (Public Lighting Site) were a Registered Electrical Contractor, being registered in accordance with:   1. Part 3 of the Electricity Safety Act 1998; and 2. Electricity Safety (Installations) Regulations 2009.   The electrical contractor was also prequalified within the VicRoads prequalification scheme at the level of ‘Traffic Control System Installation and Maintenance; Traffic Control Equipment (STCE)’. | Each Lot | R | SE/SS |  |  |  | Compliance Certificate of Electrical contractor **□** |
| **5.3** | Electrical Design | VR Clause 731.11 (c) | | Where practicable, all above ground electrical installations and works, such as point of power supply and the distribution cabinet, have been located a minimum of 5 m from any carriageway. | Each Lot | R | SE/SS |  |  |  |  |
| **5.4** | Power Supply | VR Clause 731.11 (d) | | The supply of electricity is in accordance with the following:   1. The ‘Point of Supply’ has been determined in conjunction with the relevant power distribution company. The supply of electrical power from the point of supply to the meter in the distribution cabinet has been in accordance with the requirements of the relevant power distribution company. 2. The electricity supply has been a 415 volt 3 phase AC supply. Single phase power may only be supplied with the prior written approval of the Superintendent. The low voltage power supplies has been strategically placed to minimise the maximum load on each lighting circuit and to limit the extent of voltage drop. 3. In accordance with the wiring design, copper consumer mains cable have been provided in underground conduit to the base of each LV supply point pole mechanically protected to 2.4 metres above ground level (on the pole) with 6 metre tail to power distribution company requirements for final termination by the power distribution company into a 3 phase, 100 amp, Fused Mains Box, 4 metres above ground in accordance with the Victorian Service and Installation Rules (SIRs). The cable for trunk electricity supply from the ‘point of supply’ to the road lighting distribution board or the appropriate road lighting power supply pit (where no distribution board is installed) as appropriate, is not less than 16 mm square 4 core, 3 phase plus earth, copper XLPE cable. | Each Lot | I | SE/SS |  |  |  | Installation Records from Subcontractor **□** |
| **5.5** | Electrical Distribution Cabinet | VR Clause 731.11 (e)  TCS 043 | | 1. The distribution cabinet is in accordance with VicRoads Specification TCS 043. 2. A distribution cabinet may be used to supply electricity to road lighting assets only or it may be used to supply a combination of road lighting assets and other ITS assets. 3. Unless specifically approved by the Superintendent, each site or installation shall include one only distribution cabinet. 4. Where an existing distribution cabinet does not have sufficient spare capacity for additional assets, a new distribution cabinet with sufficient capacity has replaced the existing distribution cabinet. 5. Two or more distribution cabinets at the same location are not installed. 6. The cabinet is located not less than 5 metres from any carriageway, and where possible, beyond the clear zone. For any distribution cabinet located within the clear zone, the Contractor has provided traffic barriers to protect the cabinet. 7. The PE cell has been located so as to not be affected by light spillage at night. | Each Lot | R | SE/SS |  |  |  | Installation Records from Subcontractor **□** |
| **5.6** | Earthing Requirements | VR Clause 731.11 (g)  AS/NZS 3000 | | An earth rod has been installed in the earth rod inspection pit in the concrete base of the distribution cabinet as shown on VicRoads Standard Drawing TC‑1062.  An earth cable attached to the earth rod has been provided and installed in all VicRoads lighting circuits from the distribution cabinet. All earths have been terminated within the lighting distribution cabinet in accordance with Wiring Rules AS/NZS 3000 for the M.E.N. (multiple earthed neutral) system of earthing.  Where necessary, and in accordance with the wiring design, a separate PVC insulated and sheathed earth cable has been provided to ensure compliance with AS/NZS 3000.  All poles have been individually earthed to the earth cable in the pit in the case of frangible poles and to the earth cable in the pole in the case of rigid poles.  All luminaires have been individually earthed.  The size of earth cable is to be designed to ensure a Fault Loop Impedance ‘low enough to allow sufficient current to flow in the fault loop to cause the protective device to operate within the disconnection time’ in accordance with AS/NZS 3000. | Each Lot | I | SE/SS |  |  |  | Installation Records from Subcontractor **□** |
| **5.7** | Trunk Cabling | VR Clause 731.11 (h) | | The cable used to connect the distribution cabinet to the first lighting pole and between lighting poles is one of the following methods:   1. Orange circular, 4 core and earth 2. XLPE, 4 core and earth.   For each trunk cable entering a cable pit, a minimum of 2 m of spare cable has been coiled and left in each cable pit. This is to provide spare cable length for maintenance purposes. | Each Lot | I | SE/SS |  |  |  | Installation Records from Subcontractor **□** |
| **5.8** | Jointing | VR Clause 731.11 (i) | | All electrical cable joints in pits are waterproof.  Jointing is only allowed when connecting the pole wiring to the trunk cable as detailed in (i) and (ii) below.  Joints in the trunk cable for any other purpose (e.g. to extend a cable length) are not allowed without approval from the Superintendant.  Connection of the ‘trunk’ wiring to the ‘pole’ wiring in the cable pit has been achieved in one of the following manners:   1. Bell Style Enclosure   An appropriate sized, VicRoads approved, ‘bell style’ enclosure with an ingress rating of not less than IP68. The cables to be fitted into the enclosure and sealed with heat-shrink or similar in accordance with the enclosure manufacturer’s directions. The enclosure is to include:   1. Active connector 2. Neutral connector 3. Earth connector 4. In-line, 8 amp, waterproof fuse to enable complete isolation of pole for maintenance purposes to enable complete isolation of pole for maintenance purposes.   All connectors are further protected from water ingress by use of a water-displacing gel filled cap.  The enclosure is designed to be held in place on the side of the pit, just under the pit lid, using a suitable mounting bracket. See Standard Drawings TC‑1071 and TC‑1072.   1. Underground Insulation Piercing Connectors   Suitable sized, insulation piercing, low voltage, waterproof connector. Such connectors are the type that use torque controlled, shearing type bolts. This type of connection also uses an ‘in‑line’ submersible 8 amp fuse to enable complete isolation of pole for maintenance purposes. | Each Lot | I | SE/SS |  |  |  | Installation Records from Subcontractor **□** |
| **5.9** | Pole Cabling | VR Clause 731.11 (i) | | Each pole has been cabled from the cable joint in the adjacent pit to the luminaire located at the limit of the bracket arm using one of the following methods:   1. 2 m2 core, power industry cable with separate earth cable 2. 2.5 mm2, 2 core and earth, TPS (between luminaires on a double outreach only)   Note: The use of 2.52 TPS within the pole is no longer an approved wiring method.  In an impact absorbing pole the cable has been supplied through the flexible conduit fitted inside the pole from the cable termination access door to the pole spigot, as shown in Standard Drawing TC‑1064. Where a double bracket arm is used, 1.5 m of cable has been looped between the luminaires. | Each Lot | I | SE/SS |  |  |  | Installation Records from Subcontractor **□** |
| **6.0 Labelling of Installed Assets** | | | | | | | | | | | |
| **6.1** | Distribution Cabinet Labeling | VR Clause 731.12 (a) | | A cabinet identification label conforming to VicRoads Standard Drawing TC‑2100 has been affixed to the distribution cabinet. The Superintendent will advise of the site number. The Contractor has maintained the cabinet label(s) to be clean, free of graffiti and clearly legible.  The label has been located such that is can be viewed from the roadway. | Each Lot | I | SE/SS |  |  |  | Installation Records from Subcontractor **□** |
| **6.2** | Pole Labelling | VR Clause 731.12 (b) | | Each lighting pole has a label affixed to it in accordance with drawing number TC‑2106. A VicRoads full asset number consists of a 5‑digit site asset number followed by a 3‑digit pole number. The string of 8 numbers is considered the full pole number. The pole location identifier provides for additional information to be coded. See standard drawings TC‑1076 and TC‑1077.  Each label installed has the correct number overlays stuck on - matching the pole identification as per plans and inventory information provided by the Superintendent. There has been no blank squares/boxes on a pole identification label and each square contains a number from 0 to 9.  The pole label directly faces oncoming traffic at approximately a 45 degree angle between 2.5 m to 3 m above the surrounding ground level. For any lighting pole with a single outreach, one label has been installed. For any lighting pole with a double outreach and/or lighting up multiple passageways, two labels have been installed so that they are facing oncoming traffic, allowing it to be readable from either direction. See standard drawing TC‑1078. | Each Lot | I | SE/SS |  |  |  | Installation Records from Subcontractor  **□** |
| **7.0 Completion** | | | | | | | | | | | |
| **7.1** | Backfilling, Re-Instatement and Clean-Up Works | VR Clause 731.15 | | The Contractor has undertaken backfilling in accordance with Section 733 Conduits and Pits for Underground Wiring and Cabling, clause 733.06 Backfilling.  On completion of all excavation and reinstatement works, the Contractor has ensured that all rubble, surplus crushed rock, surplus pavement materials, surplus concrete and all other surplus materials are removed from the site. The Contractor has left the work site in a clean and safe condition. | Each Lot | I | SE/SS |  |  |  |  |
| **7.2** | Compliance | VR Clause 731.16  AS/NZS 3000 | | Following implementation of the installation phase of a stand-alone VicRoads lighting installation under this standard section, the Contractor has:   1. Checked and adjusted luminaire orientation as required 2. Replaced all luminaires containing PE cells, or with the approval of the Superintendent, bypassed the PE cells in the luminaires 3. Replaced all damaged or non-functional luminaires, ballasts, and external igniters 4. Checked all brackets for type, size, shape and tolerance and replace any not in conformance with the VicRoads standard drawings and within the specified tolerance limits 5. Checked and adjusted all brackets for fixing and for orientation 6. Inspected all joint use poles and joint use mast arms for proper installation and functioning, and rectified all faults 7. Checked all lighting poles for type, size, location, orientation, bolt washers, bolt torque, slip plane washer, verticality, and ground clearance, and where not in compliance replaced, adjusted or reinstalled as appropriate 8. Inspected all pits, conduits, cables, and all other components, and where faulty repaired or replaced as necessary 9. Checked all electrical circuitry, materials, components, and equipment for conformance with AS/NZS 3000, and rectifed where full compliance has not been achieved 10. Checked and confirmed that the distribution cabinet has been properly installed and sealed from pests and moisture and rectifed as necessary 11. Inspected and tested the distribution cabinet for faults and non-complying components 12. Tested the PE Cell and switching gear and replaced if found to be faulty or performing unsatisfactorily 13. Checked circuit diagrams for accuracy of each respective circuit 14. Placed a copy of circuit diagrams in the distribution cabinet. | Each Lot | I | SE/SS |  |  |  | Installation Records from Subcontractor **□** |
| **7.3** | Testing and Certificate of Electrical Safety | VR Clause 731.16 (b) | | Prior to final acceptance, the Contractor has tested all distribution cabinets, circuits, switches, PE cells, luminaires, and all other electrical and electronic components for correct installation and operation.  The Contractor has been responsible for arranging for the issuing of a Certificate of Electrical Safety for the electrical installation. The Superintendent will not accept the lighting installation as complete until such time as the Certificate of Electrical Safety has been issued. | Each Lot | R | SE/SS |  | **W** |  | Certificate of Electrical Safety **□** |
| **7.4** | Commissioning | VR Clause 731.16 (c) | | Upon final acceptance, the Contractor has switched on the lighting installation at the distribution cabinet in automatic mode, and recorded the time, date and meter reading for contractual, warranty and power supply purposes and supplied this record to the Superintendent within 48 hours. | Each Lot | R | SE/SS |  | **W** |  | Installation Records from Subcontractor  **□** |
| **7.5** | As-Built Information | VR Clause 731.16 (d) | | The Contractor has supplied to the Superintendent a copy of ‘As‑Constructed’ plans | Each Lot | R | SE/SS |  |  |  | Survey Report **□** |
| **8.0 Work Lot Close Out** | | | | | | | | | | | |
| **8.1** | Test Reports | VIC Roads Specifications | | All Test reports received and reviewed. | Each Lot | R | SE/SS |  |  |  | NATA Endorsed Test Reports **□** |
| **8.2** | Product Non-Conformance | CQMP | | All Product Non-Conformance(s) recorded and closed (if applicable) | Each Lot | R | SE/SS |  |  |  | NCR reports **□** |

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| **Works complete (signer SE/SS)** | |  | | | **Date works complete** | |  | | | |
| **Lot conforms (signer PE)** |  | | **Date lot closed** |  | | **NCR/s no. raised** | |  | **Date NCR closed for this lot** |  |

**Responsibility (Resp.) Key**: **PM**-Project Manager, **PE**-Project Engineer, **SE**- Site Engineer, **CS**-Civil Superintendent, **SS**-Site Supervisor, S**V**-Surveyor, **CR**-Client Representative,

**SI –** Superintendent

**Inspection Key: W –** Witness, **H –** Hold Point, **S –** Surveillance, **I –** Inspection, **R –** Review Point

**Table 731.061 Pole and Luminaire Orientation Details**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Pole Height**  **SB/IA** | **Lantern Mounting Height** | **Lantern Type**  **(LED)** | **Max Bracket Length** | **Lantern Angle to Road** | **Lantern Upcast Angle** | **Lantern Spin Angle** |
| **Metres** | **Metres** |  | **Metres** | **Degrees** | **Degrees** | **Degrees** |
| 8.5 | 10.0 | L1 | 3.0 | 90 ± 5 | 5 ± 1 | 0 ± 1 |
| 11.0 | 12.5 | L2 | 5.0 | 90 ± 5 | 5 ± 1 | 0 ± 1 |
| 13.5\* | 15.0 | L4 | 5.0 | 90 ± 5 | 5 ± 1 | 0 ± 1 |

*NOTE: SB indicates Slip Base pole; IA indicates Impact Absorbing pole.*

*\*There is no 13.5 metre variant of the Impact Absorbing pole.*