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**Inspection and Test Plan – Stormwater Drainage 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-0011 | | **Revision date** | Rev 01  15/11/2023 | **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)** |
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|  |  |  |  |  | **Symal** | | | **Superintendent** | |
| **Item no.** | **Activity** | **Ref docs** | **Acceptance criteria** | **Freq** | **Key** | **Resp** | **Initial/ date** | **Key** | **Sign/ date** |
| **1.0 Pre-start activities** | | | | | | | | | | |
| **1.1** | Define Work Lot | VR Clause 173.02  701.20  701.10  701.26  IFC Drawings  QMP | Survey boundaries clearly define the Underground Drainage Construction works. Lot shall be defined from pit to pit (or end wall, where applicable).  Where required; guideposts should be installed at the edges of formations on the side of the culvert nearer approaching traffic.  **Upstream Pit:…...................................**  **Downstream Pit::…...................................**  **Culvert Type / Size / Material::…...................................** | Prior to start of works | R | SE |  |  |  | Lot Map |
| **1.2** | Conformity with Drawings | VR Clause 701.10 | Prior to commencement of excavation for the culverts the Contractor shall confirm the position of all culverts with the Superintendent.  Survey set-out of pegs, line, and height.  **Drawing No. & Rev: .....................................** | Prior to start of works | H | SE |  | H |  |  |
| **1.3** | Acceptance of Box Culverts | VR Clause 619.22  IFC Drawings | Complies with specified requirements and free of defects and to drawing dimensions.  Box culverts shall be accepted on the basis of full compliance with the requirements of this section and AS 1597.1.  Documentation supporting the following quality requirements shall be submitted for review by the Superintendent upon transport and delivery of units to site:  (a) visual inspection.  (b) dimensional measurements.  (c) measurements of clear cover to steel reinforcement.  (d) concrete compressive strength test results.  (e) proof load test results.  (f) ultimate load test results. | Prior to start of works | I | SE |  | R |  | Incoming Material Checklist **□**  Manufacturing QA Records **□**  Manufactures Compliance Certificate  **□** |
| **1.4** | Acceptance of Precast Reinforced Concrete Pipes | VR Clause 701.05  VR 610  IFC Drawing | Precast reinforced concrete shall be of the required sizes and load classes as shown on the drawings.  Rubber ring joints shall comply with the requirements of AS 1646.  Aggregates for precast reinforced concrete pipes shall comply with the requirements of Section 610  Any steel reinforced concrete pipes that have cracks wider than 0.2 mm or are damaged prior to laying and backfilling shall be rejected**.**  Documentation supporting the following quality requirements shall be submitted for review by the Superintendent upon transport and delivery of pipes to site:  (i) visual inspection  (ii) proof load test results  (iii) ultimate load test results  (iv) dimensional measurements  (v) measurements of clear cover to steel reinforcement  (vi) joint assembly. | Prior to start of works | I | SE |  |  |  | Incoming Material Checklist **□**  Manufacturing QA Records **□**  Manufactures Compliance Certificate  **□** |
| **1.5** | Bedding and Backfill Materials | VR Clause 701.09(d)  Table 701.091  Table 701.092 | Materials used for bedding and selected/ordinary backfill shall be free from perishable matter and **lumps** and shall conform with the requirements of Table 701.091 and Table 701.092. | Prior to start of works | R | SE |  |  |  | Bedding and Backfill Material Conformance  **Yes □ No □ N/A □**  Dockets **□**  NATA Test Report: Grading and PI.**□** |
| **2.0 Excavation** | | | | | | | | | | |
| **2.1** | Excavation of Trench | VR Clause 701.15  Table 701.151  701.08 | Excavate to required depth which shall also include excavation necessary to prepare the culvert/pit foundation & provide the full specified depth of culvert/ pit bedding. Maintain trench width clearances as per table 701.151. | Each lot | I | SE |  |  |  |  |
| **3.0 Bedding** | | | | | | | | | | |
| **3.1** | Bedding – Layer Thickness | VR Clause 701.16 | Bedding material shall be provided and placed for the full width of the trench or where the pipe/culvert is to be placed without trenching to a width 0.8 m greater than the overall width of the culvert or pipe. Bedding to be the compacted thickness of  100 mm where D < 1500 mm **□**  200 mm where D ≥ 1500 mm **□**  (D = Pipe Diameter/Culvert Width) | Each lot | R | SE |  |  |  |  |
| **3.2** | Bedding Material - Compaction | VR Clause 701.20 | Compact bedding to refusal using handheld mechanical equipment.  If expansive (Swell greater than 2.5%) material is utilised as bedding material, then it shall be tested for its swell properties and have the following criteria met.   * Bedding material which has a swell equal to or greater than 2.5% shall be maintained at a mean moisture ratio of 92% between the completion of rolling and the placement of the overlying layer. | Each lot | I | SE |  |  |  | NATA Test Report: Swell  **Yes □ No □ N/A □** |
| **4.0 Installation of Pipes** | | | | | | | | | | |
| **4.1** | Laying of Pipes | VR Clause 701.17 (a) (b)  AS2566 | Laying of Pipes shall not commence until it is verified that pipe bedding complies with the specified lines and levels and compaction requirements.  **Approval to proceed? □**  Laying of pipes shall commence from the downstream end. Rebate and socket ends of pipe sections shall be placed facing upstream and be fully entered. The lower portion of the pipe shall be in contact with the bedding for the full length of each section. The compacted bedding shall be shaped to accommodate the joint collar and ensure that the pipe is supported along its full length.  All conduits’ joints formed by the spigot and socket ends complying with AS2566 | Each lot | R | SE |  | I |  | NATA Test Report: Compaction  **Yes □ No □ N/A □**  Survey Conformance Report **□** |
| **4.2** | As-built Survey | VR Clause 701.10 | The location and grade of each run of underground drainage shall be verified by a survey certificate **prior** to backfilling the underground drainage.  Invert level of pipes at pits ±50 mm  Departure from design grade of pipe runs ±10 mm in 10 m provided minimum grade is not less than 1:250. | Each lot | R  I | SE |  |  |  | Survey Conformance Report **□** |
| **4.3** | Jointing and Lifting Holes | VR Clause 701.18 | All interlocking joint reinforced concrete pipes shall be mortar jointed or wrapped with a 200 mm wide external joint rubber band.  External rubber bands shall be manufactured from natural rubber and have a minimum tensile strength of 18 MPa and a minimum elongation of 400% at break.  Rubber ring joint pipes shall be jointed with rubber rings. Ensure rubber rings are clean prior to installation.  Verify joints by checking that the position of the rubber ring on the spigot, and the clearance and overlap between the spigot and socket against the values specified by the manufacturer.  Where lifting holes are provided, the pipes shall be laid with the hole uppermost. Lifting holes shall be plugged or otherwise closed off in accordance with the manufacturer’s instructions after the pipe is installed. | Each lot | W | SE |  |  |  | Visual Inspection: Joint Overlap |
| **5.0 Installation of Box Culverts** | | | | | | | | | | |
| **5.1** | Laying Box Culverts | VR Clause 701.17 (a) (c) (d) | Consecutive sections of box culverts shall be firmly butted together. The top sections shall match to the bottom sections and shall not be lapped over adjoining bottom section. The contact areas between the top and bottom sections shall be mortared. | Each lot | R | SE |  |  |  |  |
| **5.2** | Mortar | VR Clause 701.09(f)  VR610.32 | Mortar used in the laying of box culverts sections shall comply with the following requirements:   * Shrinkage compensating proprietary product. * Min 28-day compressive strength not less than **40 MPa**. * Cementitious grouts shall be min Type C Class dual shrinkage compensating.   Testing requirements:   * Three 75 mm test cubes shall be taken from the first batch of material mixed, then three 75 mm cubes for every 100 kg of material used thereafter to test for compressive strength. Following (2 x 7-day cubes, 1 x 28-day cube). | Each lot | R | SE |  |  |  | Technical Data Sheet  **Yes □ No □**  Delivery Dockets of Mortar **□**  Compressive strength Report **□** |
| **6.0 Completion of Works and Backfilling** | | | | | | | | | | |
| **6.1** | Backfill Underground Drainage | VR Clause 701.19 | Place and compact backfill material in max loose layer thickness of 150 mm.  (i) **Under area to be paved: □**  Where the trench has been excavated from design subgrade level or above, the trench shall be backfilled to design subgrade level with selected backfill material, and above that level with appropriate pavement material.  Where the trench is excavated from below design subgrade level the trench shall be filled with selected backfill material.  (ii) **Under area not to be paved:** **□**  The trench shall be backfilled with selected backfill material to a level 0.3 m above the top of the culvert and with ordinary backfill material above that level. | Each lot | R  I | SE |  |  |  |  |
| **6.2** | Backfill with Cement Stabilised Sand | VR Clause 701.19 (c) | Culverts in trenches may be backfilled to half the pipe diameter or box culvert height with 3% cement stabilised sand with a water content sufficient to ensure penetration beneath the pipe or box culvert invert without leaving free surface water. | Each lot | H | SE |  |  |  | Delivery Dockets **□** |
| **6.3** | Testing – Backfill Material | VR Clause 701.29 | Grading and Plasticity Index– one test per 1000 tonnes or part thereof. | Each lot | R | SE |  |  |  | NATA Test Report: Grading and PI **□** |
| **6.4** | Compaction: Backfill | VR Clause 701.20 | One lot is to be raised for backfill for a culvert length (between adjacent pits or end-walls). 3 tests required per layer and **a minimum of 20% of all layers for each culvert shall be tested**.  **Mean density ratio:**  **□** Material nominal size 40 mm or less after compaction: Mean density ratio not less than 97%.  **□** Material nominal size greater than 40 mm after compaction: Submit RFI compacted using a grading, mixing, watering, and rolling procedure that has been trialled, tested and proven. | Each lot | R | SE |  | R |  | Total number of layers: **…….**  Layers Tested:**…….…..**  NATA Test Report: Compaction and Moisture Content **□** |
| **6.5** | Flushing of culverts | 701.28 | All culverts shall be flushed clean from end to end on completion and maintained in proper working order. | Each lot | W | SE |  |  |  | Flush out Checklist **□** |
| **6.6** | Existing Pipes Inspection | 1630-P200-SYM-CVD-DRG-0003 | Where existing pipes are to be retained, Symal are to undertake CCTV to confirm that pipes are in a satisfactory condition and clear of silt and debris.  If necessary, the existing pipe and culverts are to be replaced. | Each lot | R | SE |  |  |  |  |
| **6.7** | CCTV Inspection | 701.30 | All drainage lines constructed shall be visually inspected using CCTV by an independent testing organization for the full length between pits after completion of earthworks to subgrade level and before commencement of pavement construction.  Reporting of the CCTV inspections shall be in accordance with WSA 05 2013 – Conduit Inspection Reporting Code of Australia, published by Water Services Association of Australia.  Upload to the work lot, the report and the CCTV footage. The report shall include a summary of the location of any defects detected by the survey.  The lot diagram shall clearly identify the length of drainage pipes for which the CCTV footage was inspected. | Each lot | H | SE |  | H |  | CCTV Inspection Report & Footage **□** |
| **6.8** | Repairs to damaged pipes and box culverts | VR Clause 701.31 | Where inspections after backfilling identify any of the following defects they shall be notified as a non-conformance:   * cracks wider than 0.5 mm * spalling of concrete * exposed reinforcement * joints that are not fully engaged.   Any pipes with defects greater than the following limits shall be removed and replaced:   * longitudinal cracks greater than 2 mm * circumferential cracks around the full circumference with width greater than 3 mm or with lateral displacement of the cracked sections exceeding 3 mm * circumferential cracks around part of the circumference with width greater than 4 mm * penetrations with area greater than 400 mm2 * pipe joints that are separated.   Other types of pipes which exhibit defects or are otherwise damaged prior to laying and backfilling shall be rejected.  Box culverts which do not comply with the requirements of clause 619.14 prior to laying and backfilling shall be rejected and removed from the site.  The Contractor shall submit details of proposed rectification treatments including manufacturer’s product specifications and warranties, the area and thickness of repair treatment, detailed repair procedures, and inspection and test plans.  **No repairs shall be undertaken without the Superintendent’s approval of the repair materials and procedures**. | Each lot | H | SE |  | H |  |  |
| **7.0 Close-Out** | | | | | | | | | | |
| **7.1** | Test Reports |  | All Test reports received and reviewed | Each lot | R | SE |  |  |  | NATA Endorsed Test Reports **□** |
| **7.2** | Product Non-Conformance | QMP | All Product Non-Conformance(s) recorded and closed (if applicable) | Each lot | R | SE |  |  |  | NCR No\_\_\_\_\_\_\_\_\_\_\_  NCR reports |
| **7.3** | Quality Representative to check the above criteria and records to confirm | CQMP  Lot Records | All above criteria met, and records identified attached. | Each lot | R | SE |  |  |  | Completed Checklist (if applicable) and reports and other compliance records attached. |

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| **Works complete (signer SE)** | |  | | | **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, **SV**-Surveyor, **CR**-Client Representative

**SI –** Superintendent

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

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