SECTION 733 - CONDUITS AND PITS FOR UNDERGROUND WIRING AND CABLING

##This section cross-references Sections 173, 730, 731, 732, 734 and 735 as applicable.

If any of the above sections are relevant, they should be included in the specification.

If any of the above sections are not included in the specification, all references to those sections should be struck out, ensuring that the remaining text is still coherent.

733.01 General

733.02 Pre-qualified contractors

733.03 Referenced and related specifications, standards and drawings

733.04 Materials

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733.10 Detector pits

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733.01 GENERAL

(a) Scope

This section covers the requirements for the supply and installation of conduits and pits, for underground electrical wiring and communications cabling within the state of Victoria for works supervised by the Department of Transport and Planning (DTP) - formerly Department of Transport (Roads), formerly VicRoads, and works supervised by others where the asset will be returned to the State. This document shall be read in conjunction with DTP Standard Drawings and individual contract documents.

(b) General Requirements

The contractor shall be responsible for the installation of all electrical and communications conduits, electrical cable pits, telecommunications pits and any other associated works in accordance with this Standard Section, relevant Standard Drawings and individual contract documents and drawings.

Conduits shall be installed in accordance with the relevant utility and industry codes, regulations and standards applying to their intended use.

(c) Installation of Electrical Conduits and Pits

Electrical conduits, and associated cable pits, installed as part of an electrical installation MUST be installed by, or under the direct supervision of a Pre-qualified and Registered Electrical Contractor.

**Direct Supervision** refers to a situation where a nominated, STCE (for on-road electrical related works) or STS (for traffic signal related works) pre-qualified, electrical contractor is present, at all times, while works are being carried out.

The carrying out of electrical installation works by anyone other than a licensed electrician is prohibited under Energy Safe Victoria (ESV) Regulations and Electrical Safety Regulations.

**733.02 PRE-QUALIFIED CONTRACTORS**

All works associated with the installation and of all conduits and pits covered under this specification shall be undertaken by contractors that are appropriately pre-qualified as detailed in Table 733.021 below.

**Table 733.021: Contractor Pre-Qualification Level Requirements**

|  |  |
| --- | --- |
| **Conduits and pits for** | **Pre-Qualification Level** |
| Works on or associated with traffic signals | STS1 |
| All other on-road electrical works | STCE |
| Works associated with DTP owned communications networks | STCE |
| Works associated with telecommunications carrier networks | SCTV  (must hold ACMA licence) |

Sub-contractors undertaking works covered under this specification shall be pre-qualified at the appropriate level under the DTP contractor pre-qualification scheme, in the sub-contractors own right.

733. 03 REFERENCED AND RELATED SPECIFICATIONS, STANDARDS AND DRAWINGS

All works associated with the installation of electrical conduits covered under this specification shall conform to the general requirements of the following, in the listed descending order of precedence:

1. AS/NZS 3000 Wiring Rules
2. AS/ACIF S009 Installation requirements for customer cabling (Wiring Rules)
3. Electricity Safety (registration and licensing) Regulations 2010
4. Electricity Safety (installations) Regulations 1999 (reprinted September 2007)
5. Electrical safety act 1998 (reprinted November 2011)
6. DTP Contract Standard Sections (as indicated throughout this document)
7. DTP) ‘TCS’ series specifications
8. DTP ‘TCG’ series Guidelines
9. DTP ‘TC’ series drawings (as indicated throughout this document)
10. Drawings included in the Principal’s preliminary design
11. Technical specifications included in the Appendices

**NOTE:** DTP standard sections, specifications and associated standard drawings are subject to periodic review. To keep the specifications up to date, amendments or new editions are issued as necessary. It is therefore important for users of DTP specifications to ensure that they have the latest version and associated amendments from VicRoads website.

The relevant requirements of the ACMA shall apply to the provision of all communications facilities.

The individual requirements of VESI and the local electricity distribution business shall apply for matters relating to the installation of conduits and pits for the provision of mains power and VESI lighting at traffic signal sites.

Australian Standards referred to in this section are listed in Table 733.031.

Relevant standard drawings for traffic signal and other general works are listed in Table 733.032.

Relevant standard drawings for managed motorway works are listed in Table 733.033

**Table 733.031: List of Australian Standards**

|  |  |
| --- | --- |
| **Australian Standard** | **Title** |
| AS 1319 | Safety signs for the occupational environment |
| AS 1345 | Identification of the contents of pipes, conduits and ducts |
| AS/NZS 2053 | Conduits and fittings for electrical installations |
| AS/NZS 2648.1 | Underground marking tape - Non-detectable tape |
| AS/NZS 3000 | Electrical installations (known as the Australian/New Zealand Wiring Rules) |
| AS 3008.1.1 | Electrical installations - Selection of cables - Cables for alternating voltages up to and including 0.6/1 kV - Typical Australian installation conditions |
| AS/NZS 61386 | Conduit systems for cable management |

**Table 733.032: List of Standard Drawings for Street Lighting, Traffic Signals and General Works**

|  |  |
| --- | --- |
| **Drawing Number** | **Title** |
| TC-1062 | Electrical Distribution Cabinet Type 1 – Foundation Detail |
| TC-1071 | Impact Absorbing Pole – Electrical Installation Details |
| TC-1072 | Slip Base Pole – Electrical Installation Details |
| TC-1074 | Electrical Distribution Cabinet – Type 2 – Foundation Detail |
| TC-1200 | Foundation for pedestals |
| TC-1201 | Bored pile foundations for traffic signal posts |
| TC-1202 | Spread footing for JUP’s MA’s and JUMA’s |
| TC-1206 | Assembly and installation of consumers mains and meter box |
| TC-1207 | General layout – traffic signal ducting |
| TC-1210 | Cable pit former – 600mm Dia |
| TC-1211 | Heavy duty cable pit and cover |
| TC-1217 | Shallow conduit warning sign |
| TC-1220 | Cable pit access cover and frame 600mm Dia |
| TC-1230 | 600mm Cable pit – Installation details |
| TC-1233 | 750mm Cable pit – Installation details |
| TC-1310 | Detector pit and lid |
| TC-1320 | Detector pit – Installation details |
| TC-2013 | Camera column – Bored pile foundation installation details |

**Table 733.033: List of Standard Drawings for Managed Motorway Works**

|  |  |
| --- | --- |
| **Drawing Number** | **Title** |
| TC-2200 | 600mm round electrical cable pit |
| TC-2201 | 750mm round electrical cable pit |
| TC-2202 | 750mm round communication junction pit |
| TC-2203 | P9 communication pit |
| TC-2204 | Electrical and communication trenches |
| TC-2206 | Multiple pit arrangements |
| TC-2207 | General arrangement at gantries |
| TC-2208 | General arrangement at an interchange |
| TC-2209 | General arrangement at communication hut |
| TC-2210 | Transition to bridge barrier – Typical arrangement |
| TC-2211 | Typical arrangement at existing structures |
| TC-2215 | General arrangement at point of supply |
| TC-2216 | Cable pit former 750mm Dia to suit 600mm Dia lid |
| TC-2217 | Cable pit access cover, frame and concrete surround 750mm Dia |
| TC-2220 | VSLS Pole and Base Plate |
| TC-2223 | RC3 / TTS Pole Typical Arrangement |
| TC-2230 | Typical single ITS Field cabinet foundation |
| TC-2231 | Typical distribution cabinet Type 1 |
| TC-2232 | Typical distribution cabinet Type 3 |
| TC-2233 | VSLS Pole foundation concrete |
| TC-2235 | RC3 pole spread foundation Type 1 – typical arrangement |
| TC-2236 | RC3 pole spread foundation Type 2 – typical arrangement |
| TC-2239 | Double ITS Field cabinet foundation |
| TC-2250 | Cantilever gantry for 2 lanes metered (sheet 1 of 2) |
| TC-2252 | Portal gantry for 3 or more lanes metered (sheet 1 of 3) |
| TC-2264 | Foundation conduit details - Typical arrangement  (non-accessible gantry) |
| TC-2286 | Foundation conduit details – Typical arrangement  (accessible gantry) |
| TC-2302 | Communications Hut  Access arrangements and compound layout plan |

**733.04 MATERIALS**

(a) Conduits

Unless otherwise specified, the Contractor shall provide all plastic conduits which shall comply with the following standards as appropriate:

* AS 1345 – Identification of pipes, conduits and ducts
* AS/NZS 2053 – Conduits and fittings for electrical installations

All conduits installed underground for electrical wiring, traffic signals and traffic services shall be heavy duty grade, rigid, solid wall, orange, UPVC conduit to AS/NZS 2053.2.

All conduits installed underground for communication cables shall be heavy duty grade, rigid, solid wall, white UPVC communication conduit complying with AS/NZS 2053.2 and complying with all relevant Australian Communications and Media Authority (ACMA) publications and standards.

The use of HDPE continuous conduit for bored road crossing is permitted. Where HDPE continuous conduit is used for electrical cables, it shall not be smaller in internal diameter than the specified UPVC heavy duty conduit. See Table 733.041 for typical conduit sizes.

Where HDPE continuous conduit is used for communications cables, it shall not be smaller in internal diameter than the dimensions shown in Table 733.041.

**Table 733.041: Typical Conduit sizes**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | **100mm HD UPVC Conduit\*** | | **HDPE Continuous Conduit** | |
| Electrical | 114.1mm OD | 101.7mm ID | 125mm OD | 103mm ID\*\* |
| Comms | 114mm OD | 104.5mm ID | 110mm OD | 90mm ID |

\* Multilayer, HD conduits using recycled materials may be used as detailed in TCG 018.

\*\* HDPE Continuous conduit with a smaller ID than shown above **shall not** be used in place of 100mm HD UPVC.

(b) General Arrangements and Specified Conduit Sizes

General arrangements and specified conduit sizes for DTP) works shall be in accordance with the relevant DTP specifications, guidelines and standard drawings.

Relevant standard drawings for traffic signal and other general works are listed in Table 733.032.

Relevant standard drawings for managed motorway works are listed in Table 733.033

(c) Bedding and Backfill Materials

Unless otherwise specified, the Contractor shall supply all bedding and backfill material in accordance with the requirements of Clause 733.08.

(d) Pits

Unless otherwise specified, the Contractor shall supply all pits and lids in accordance with the requirements of Clauses 733.09.

**733.05 EXCAVATION, BORING AND TRENCHING**

Unless otherwise specified, all conduits under a road carriageway shall be installed by boring.

**HOLD POINT: DETAILED PROPOSALS FOR BORING UNDER CARRIAGEWAYS SHALL BE SUBMITTED TO THE SUPERINTENDENT FOR REVIEW TWO WEEKS PRIOR TO THE PROGRAMMED COMMENCEMENT OF WORK.**

Boring by water jetting is not permitted.

The annulus between the bore and the carrier conduits shall be filled by low thermal resistivity, flowable and pumpable grout mixture (comprising sand, cement and suitable additives such as flowable fill). The grout mixture shall be suitable for backfilling around conduits carrying low voltage electrical cables and shall have the following properties:

* low exothermic temperature generation during curing.
* a thermal resistivity (TR) value of less than 1.2K.m/W when fully dried.
* a maximum grout flow time through a standard flow cone test of 30 seconds in accordance with AS 1478.2.
* compressive strength in the range of 0.5 to 2.0 MPa at 28 days.
* a maximum heat of hydration of 35ºC when tested in an insulated 300mm x 300mm cube.

Grouting shall fill the voids at low injection pressures without causing deformation to the conduits within the bore holes. The ends of conduits shall be sealed watertight to prevent ingress of grout.

Testing of the grout shall be carried out as follows:

* The frequency of sampling and testing shall provide at least one sample at the point of discharge to be tested of each 50 m3 or part thereof of placed on any one day.
* This should include standard flow cone in accordance with AS 1478.2.

**HOLD POINT: BEFORE BACKFILLING THE BORE ACCESS EXCAVATION, THE PRESSURE GROUTING SHALL BE INSPECTED BY THE SUPERINTENDENT OR REPRESENTATIVE.**

Unless otherwise shown on the drawings or specified, borings and trenches shall comply with the depth requirements specified in Table 733.051.

**Table 733.051: Minimum Conduit Cover**

|  |  |  |
| --- | --- | --- |
| **Location** | **Minimum Depth of Cover (mm)** | **Measured from** |
| Under freeway pavement | 1200 | Top of conduit to pavement surface |
| Under Arterial Road pavement | 1200 | Top of conduit to pavement surface |
| Under local road pavement | 600 | Top of conduit to pavement surface |
| Under open drains | 750 | Top of conduit to invert level of drain |
| Under footpath or unpaved areas  (low voltage circuits e.g. 240Vac) | 600 | Top of conduit to finished surface level |
| Under footpath or unpaved areas  (Extra low voltage and comms conduits only) | 300 | Top of conduit to finished surface level |
| Under tram tracks | 1200 | Top of conduit to top of track surface level |
| \*Under railway-road crossings | 2000 | \*Top of conduit to top of track surface level |

Where minimum depth of cover is not possible, the contractor may submit a request for an exemption for consideration by the Superintendent, in accordance with Technical Notice TCN 010. The contractor shall not install any conduits with a reduced depth of cover unless approved by the Superintendent in writing.

Where a reduced depth of cover is approved, a warning sign as per standard drawing TC-1217 shall be installed on the ground above the conduit warning of the shallow conduit.

Open trenching shall be permitted in unpaved areas and across unpaved subgrade areas.

Where open trench methods are accepted, the lines of trenches wherever practical, shall be straight and form the shortest link between terminals.

Where the open trench method of crossing under a carriageway pavement is accepted, the line of the trench shall be at right angles to the carriageway, and the edges of trenches located within a road pavement shall be sawcut.

Trench/conduit depth shall be maintained between pits and graded to avoid low points in the conduit run.

Any drains or services disturbed during the excavation or laying of conduits shall be immediately reported to the Superintendent and shall be reinstated promptly.

**733.06 INSTALLATION OF CONDUITS**

(a) General

All conduits shall be installed as shown on the Standard Drawings and Contract specific drawings, or as otherwise specified.

All conduits for electrical and communications cabling shall be installed to conform to the relevant requirements of controlling legislation, regulations, industry codes and standards, including:

* AS/NZS 3000 Electrical installations (Australian/New Zealand Wiring Rules)
* AS/ACIF S009 Installation requirements for customer cabling (Wiring Rules), and any other relevant requirements of the Australian Communications and Media Authority (ACMA) for connections to telecommunication carriers’ network.

Installation of conduits shall be carried out in accordance with the approved installation method for the type of conduit as shown in Table 733.061.

Where existing conduits are to be reused the Installation Contractor shall prove the existing conduits are clear, undamaged and comply with minimum depth of cover requirements prior to installing any new cables.

If existing conduits do not meet current minimum depth of cover requirements as specified in Table 733.051, new LV cables **shall not** be installed in the conduits without approval from the Superintendent and in accordance with the requirements of TCN 010.

**Table 733.061: Approved Conduit Types**

|  |  |
| --- | --- |
| **Conduit Type** | **Installation Method** |
| HD UPVC Plain | Thrust bore  Open trench |
| HDPE continuous  (must have ID not less than that of 100 mm HD UPVC for electrical and 90 mm HD UPVC for communications) | Directional Bore |

Conduits installed for DTP works shall be installed to the following requirements:

1. all conduits shall terminate in a pit.
2. only one size and type of conduit shall be used for a complete run between pits; unequal size conduits shall not be joined in the ground.
3. all conduits shall be temporarily sealed prior to cabling to avoid blockage.
4. changes in direction of conduit shall only be made at approved cable pits.
5. changes in conduit direction to enable entry into the base of a cable pit may be by means of a sweep bend as shown in Table 733.062.
6. elbows and ‘tees’ shall not be used.
7. all conduit joints shall be correctly prepared and sealed with approved solvent cement.
8. conduits for detector cables shall be installed as shown in Standard Drawings TC‑1207 and TC‑1320.
9. a 50 mm electrical (orange) conduit shall be used to convey the detector feeder cable from the detector pit to the cable pit, as shown in Standard Drawing TC‑1207.

**Table 733.062: Acceptable Conduit Types**

|  |  |
| --- | --- |
| **Conduit Type** | **Minimum bend radius** |
| HD UPVC Electrical | 600mm |
| HD UPVC Communications | 500mm |

(b) Conduit Installation for Traffic Signals and other On-Road Electrical Installations

Conduits installed for traffic signals and other on-road electrical installations shall be installed in accordance with this standard specification, DTP Standard Drawings detailed in Table 733.032 and individual contract documents.

(c) Conduit Installation for Managed Motorways and Freeways

Conduits installed on Managed Motorways and freeways shall be installed in accordance with this standard specification, DTP Standard Drawings detailed in Table 733.033 and individual contract documents.

A marker tape with trace wire shall be placed above all conduits in accordance with the Wiring Rules.

(d) Conduits in concrete structures

Conduits installed within a concrete structure such as a bridge deck shall be installed in accordance with the standard specification where possible. Where minimum depth of cover or minimum conduit size cannot be achieved, the contractor may submit a request for an exemption for consideration by the Superintendent.

The Superintendent may consider a reduced depth of cover and a smaller diameter conduit within concrete structures such as bridge decks where there is insufficient capacity within the bridge deck to meet normal requirements.

Where smaller conduits are installed, there shall be an increase in number of conduits to compensate for the reduced conduit capacity.

The contractor shall not install any smaller conduits or conduits with a reduced depth of cover unless approved by the Superintendent in writing.

(e) Asbestos conduits

Where an existing site is being upgraded and asbestos conduits exist on site, the conduits shall be removed and replaced in accordance with TCG-015.

**733.07 DRAW CORDS**

Each conduit for electrical wiring and communication cables shall be provided with one synthetic draw cord not less than 3 mm diameter and with a minimum breaking strain of 1.6 kN.

Where the conduit terminates in a pit, not less than 500 mm of the draw cord shall be tied to a marker peg 25 mm x 25 mm, not less than 300 mm long, and left coiled in the pit. A length of 100mm diameter conduit not less than 200mm may be used.

Where the conduit does not terminate in a pit, the draw cords shall be tied to a marker peg 100 mm x 100 mm, not less than 400 mm long, driven firmly into the ground with the top 50 mm projecting above finished surface and painted yellow.

**733.08 BACKFILLING**

(a) Material

Unless otherwise specified, materials used for bedding and backfilling shall be free from perishable matter and shall conform with the appropriate grading and plasticity index requirements specified in Table 733.081.

**Table 733.081: Approved bedding and backfilling material**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Material** | **Sieve Size ‑ AS (mm)** | | | | | **Plasticity Index** | |
| **75.0** | **37.5** | **19.0** | **2.36** | **0.075** |
| **Percentage Passing (by mass)** | | | | | **Min** | **Max** |
| Bedding | ‑ | ‑ | 100 | ‑ | 0‑40 | 0 | 10 |
| Selected backfill | ‑ | 100 | ‑ | ‑ | 10‑40 | 5 | 20 |
| Common backfill | 100 | ‑ | ‑ | 40‑100 | ‑ | ‑ | ‑ |

Pavement material shall be as specified and shall comply with the relevant requirements of the appropriate pavement sections.

(b) Bedding

1. General

Bedding material shall be placed and compacted for the full width of the trench to a depth of not less than 80 mm on an earth foundation or 200 mm on a rock foundation.

Following compaction, the bedding material shall be shaped sufficiently to maintain the conduit in line as the sections are placed in position. Shaping of bedding material is not required for conduits less than 100 mm nominal diameter.

**HP Once the bedding material has been laid and the conduits put in place, works shall not proceed prior to inspection by superintendent or representative.**

When conduit sections are in position, additional layers of bedding material shall be placed and compacted to a height 150 mm above the bedding previously placed.

Bedding material must not be the same material excavated for the trench, it shall be clearly identifiable as introduced material.

Where the trench has been excavated from the design subgrade level or above, the trench shall be backfilled to design subgrade level with selected backfill material, and above that level with common backfill material or the specified pavement material.

Where the trench is excavated from below design subgrade level, the trench shall be filled with selected backfill material.

(ii)   Recycled crushed glass sand

The use of recycled crushed glass sand (RCGS) as a bedding material is permitted subject to the RCG meeting the requirements of ATS 3050 Supply of Recycled Crushed Glass Sand and Grading Classification Type A.

(c) Filling

Unless otherwise specified or shown on the drawings, selected and common backfill shall be placed and compacted as follows under, around, and above the conduit after the sections are bedded.

1. Conduits under Area to be Paved

Where the trench has been excavated from the design subgrade level or above, the trench shall be backfilled to design subgrade level with selected backfill material, and above that level with common backfill material or the specified pavement material.

Where the trench is excavated from below design subgrade level, the trench shall be filled with selected backfill material.

1. Conduits under Area not to be Paved

The trench shall be backfilled with selected backfill material to a level of 0.4 m above the top of the conduit and with common backfill above that level.

1. Conduits through Existing Paved Area

Unless otherwise specified or shown on the drawings, the trench shall be backfilled to the existing subgrade level with selected backfill material and the pavement restored using materials in accordance with sub‑clause (e) below.

(d) Compaction

Unless otherwise specified, bedding and backfill materials shall have during compaction, a uniform moisture content within the range 85% to 115% of the optimum moisture content as determined in the Standard Compaction test. Where backfill material contains material retained on a 37.5 mm AS sieve, the Standard compactive effort will be performed on the material passing the 37.5 mm AS sieve, and during compaction the moisture content of the material passing the 37.5 mm AS sieve shall be in the range 85% to 115% of the optimum moisture content so determined.

Bedding and backfill, the whole of which passes the 37.5 mm AS sieve, shall be compacted in layers to a density ratio of not less than 95% using hand-held mechanical plant or excavator attached DPU for steep inclines.

Detailed proposals for the compaction of backfill materials of nominal size greater than 40 mm shall be submitted to the Superintendent for review before commencing work.

Where specified, pavement material shall be assessed for compaction in lots as defined in Section 173. The number of tests per lot shall be three. All pavement material shall have during compaction, uniform moisture content within the range 85% to 115% of the optimum moisture content as determined in the Modified Compaction test. All pavement layers shall be placed and compacted in layers to a density ratio of not less than 98%. The calculation of density ratio shall be based on Modified compactive effort.

(e) Pavement Composition

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|  |  |  |
| --- | --- | --- |
| **Pavement Layer** | **Material Type** | **Thickness**  **(mm)** |
| ##: |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |

(f) Surfaced finish

All surface areas such as footpaths, paved areas, grassed areas, etc., shall be reinstated to a finish and condition that is not inferior to the original surface finish and condition (e.g. grass to grass, concrete to concrete, asphalt to asphalt, etc.). All surface areas shall be reinstated to the satisfaction of the Superintendent.

**733.09 CABLE PITS AND PIT LIDS (ELECTRICAL AND COMMUNICATIONS)**

(a) General

All cable pits, cable pit lids and preformed cable pit lid surrounds shall be DTP Type Approved.

Pits and lids shall be installed in accordance with the appropriate DTP standard drawing and any pit manufacturers specific installation requirements.

Pits shall be located in accessible locations for maintenance activities.

Pits SHALL NOT be installed within the trafficable area on a freeway or managed motorway.

On arterial roads pits shall not be installed within the trafficable area of the roadway. In extreme circumstances, the Superintendent may consider requests to install a pit in a trafficable area on an arterial road. In these instances, where approved, heavy duty pit lids shall be provided where the pit is located within a road pavement.

Pits shall be constructed such that the level of the top of the pit lid matches the surrounding finished surface level.

The top of the pit wall shall be neatly finished such that the lid fits without movement.

Cable pit lids shall be labelled in accordance with TC-1220 as appropriate.

The pit former shape shall not be distorted during installation.

Pits shall be placed, as far as is practicable, in an area that has an incline (i.e. slope) not more than 20O. Where the surrounding surface level is inclined greater than 20O, the pit lid shall be installed in accordance with the following requirements:

1. The pit former shall be vertical.
2. The lid shall be horizontal.
3. The lid shall be installed within a re-enforced concrete apron ‘standing area’ to enable safe access to the pit lid. The apron shall be large enough to enable temporary storage of a removed lid.
4. A retaining wall shall be installed on the angled sides and high side of the slope. The retaining wall shall extend a minimum of 100mm above the surrounding surface level.
5. A post, a minimum of 600mm in height, shall be located on each upper corner of the retaining wall to ensure visibility for mowers and other maintenance personnel.
6. Hand-rails and access steps shall be installed where required by Australian Standards.

All pits, junction boxes or terminal pits for electrical purposes shall be either watertight or suitably drained.

All conduit connections to cable pits shall be neatly made and the ends of the conduits trimmed off and deburred to prevent damage to cables. Pits installed for Managed Motorway installations shall also be fitted with a conduit bush. The area between the conduit and pit wall shall be stopped with a suitable sealant that bonds to the pit wall and the conduit.

Where existing pits are to be reused the Installation Contractor shall prove they are undamaged and comply with this specification prior to installing any new cables.

The maximum spacing between cable pits shall not be greater than 100m.

(b) Asbestos pits

Where an existing site is being upgraded and asbestos pits exist on site, the pits shall be removed and replaced in accordance with TCG-015.

(c) Pit lid surrounds

Cable pit lids and frames shall be installed with an approved surround. The approved types of pit lid surround are:

1. A poured ‘in-situ’ concrete surround (i.e. a poured ‘in-situ’, rounds concrete collar).
2. A poured ‘in-situ’ concrete apron (typically used where two or more pits are co-located).
3. A steel pre-formed collar that requires concrete in-filling ‘in-situ’.
4. A pre-formed concrete collar (bedded into fresh poured concrete.
5. A pre-formed composite material collar (bedded into fresh poured concrete).

All surrounds shall be installed in accordance with the appropriate DTP standard drawing and shall ensure that no load is placed on the cable pit former.

For pre-formed collars, concrete or composite material, the collar shall be bedded into a base of cement to ensure it remains level with the surrounding surface and that no load is placed on the pit former. The cement bedding shall be a minimum of 200mm thick and extend a minimum of 100mm past the outer diameter of the collar.

**HOLD POINT: BEFORE THE PIT LID SURROUND OR PRE-FORMED COLLAR IS CEMENTED INTO POSITION AN INSPECTION BY THE SUPERINTENDENT OR REPRESENTATIVE MUST BE CARRIED OUT.**

(d) Cable Pits and Lids for Traffic Signals and other on-road electrical installations

Cable pits shall be constructed and installed as shown in the drawings detailed in Table 733.091.

**Table 733.091: List of Standard Drawings for Pits for Traffic Signals and General Works**

|  |  |
| --- | --- |
| **Drawing Number** | **Title** |
| TC-1210 | Cable pit former – 600mm Dia |
| TC-1211 | Heavy duty cable pit and cover |
| TC-1220 | Cable pit access cover and frame 600mm Dia |
| TC-1230 | 600mm Cable pit – Installation details |
| TC-1233 | 750mm Cable pit – Installation details |

(e) Cable Pits and Lids for Managed Motorways and freeways

Cable pits shall be constructed and installed as shown in the drawings detailed in Table 733.092.

Cable pits shall be numbered in accordance with Contract specific requirements.

**Table 733.092: List of Standard Drawings for Pits for Managed Motorways and freeways**

|  |  |
| --- | --- |
| **Drawing Number** | **Title** |
| TC-2200 | 600mm round electrical cable pit |
| TC-2201 | 750mm round electrical cable pit |
| TC-2206 | Multiple pit arrangements |
| TC-2207 | General arrangement at gantries |
| TC-2208 | General arrangement at an interchange |
| TC-2209 | General arrangements at communications huts |
| TC-2210 | Transition to bridge barrier - Typical arrangement |
| TC-2211 | Typical arrangement at existing structures |
| TC-2215 | General arrangement at point of supply |
| TC-2216 | Cable pit former 750mm Dia. To suit 600mm Dia. Lid |
| TC-2217 | Cable pit access cover, frame and concrete surround – 750mm Dia. |

(f) Communication Pits and Lids for Managed Motorways and freeways

Communications pits shall be constructed and installed as shown in the drawings detailed in Table 733.093.

Communications pits shall be numbered in accordance with Contract specific requirements.

**Table 733.093: List of Standard Drawings for Communication Pits for Managed Motorways and freeways**

|  |  |
| --- | --- |
| **Drawing Number** | **Title** |
| TC-2202 | 750mm round communication junction pit |
| TC-2203 | P9 communication pit |
| TC-2206 | Multiple pit arrangement |
| TC-2207 | General arrangement at gantries |
| TC-2208 | General arrangement at an interchange |
| TC-2209 | General arrangements at communications huts |
| TC-2211 | Typical arrangement at existing structures |
| TC-2217 | Cable pit access cover, frame and concrete surround – 750mm Dia. |

(g) Communication Pits and Lids for Arterial Roads

Communications pits shall be constructed and installed as shown in the drawings detailed in Table 733.094.

**Table 733.094: List of Standard Drawings for Communication Pits for Arterial Roads**

|  |  |
| --- | --- |
| **Drawing Number** | **Title** |
| TC-1210 | Cable pit former 600mm Dia |
| TC-1220 | Cable pit access cover & frame 600mm Dia |
| TC-1230 | Cable pit installation details |
| TC-2203 | P9 communication pit |

(h) Maximum number of conduits per pit type

The number of conduits terminating in a pit shall be dependent on the individual contract requirements and the electrical/communications network designs.

Table 733.095 provides details of the maximum number of conduits allowed for each pit type. Under no circumstances shall the maximum number of conduits shown in Table 733.095 be exceeded.

**Table 733.095 List of Maximum conduits in Pits**

|  |  |  |  |
| --- | --- | --- | --- |
| **Pit Type** | **Drawing No** | **Asset type** | **Maximum Number of Conduits** |
| 750mm round pit | TC-1233 | Traffic Signals | 9 x 100mm, including maximum 4 x 100mm bottom entry  plus 3 x 50mm and  3 x 63mm (VESI lighting only), including 2 x 63mm bottom entry |
| 600mm round pit | TC-1230 | Traffic Signals | 6 x 100mm, including maximum 2 x 100mm bottom entry  plus 2 X 50mm and  2 x 63mm (VESI lighting only), including 1 x 63mm bottom entry |
| 600mm electrical round pit | TC-2200 | Managed Motorways | 6 x 100mm, including maximum 2 x 100mm bottom entry |
| 750mm electrical round pit | TC-2200 | Managed Motorways | 9 x 100mm, including maximum 3 x 100mm bottom entry  plus 1 x 50mm |
| 750mm communication round junction pit | TC-2202 | Managed Motorways | 6 x 100mm, including maximum 2 x 100mm bottom entry |
| P9 communication pit | TC-2203 | Managed Motorways &ITS Assets | 8 x 100mm side entry (4 on each side) |
| 600mm round pit | TC-1230 | ITS Assets | 6 x 100mm, including maximum 2 x 100mm bottom entry |

(i) Pits in concrete structures

Pits installed within a concrete structure such as a bridge deck shall be installed in accordance with the standard specification where possible. Where the depth of the concrete structure is insufficient for pits to be installed in accordance with the standard specification, the contractor may submit a request for an exemption for consideration by the Superintendent.

Examples of potential alternative options are as follows:

1. Shallow 600mm cable pit.
2. An alternative to a 600mm pit such as a steel junction box set within the concrete structure.

Type approved pit lids shall be used for all alternative pit constructions where possible.

The contractor shall not install any alternative pit arrangements unless approved by the Superintendent in writing.

**733.10 DETECTOR PITS**

Detector pits are typically used to enable the connection of loop cables to detector feeder cables.

Detector pits for traffic signals shall be installed as shown on the traffic signal plans and as detailed in individual contract documents.

Detector pits for freeway data stations or other required purposes shall be installed as detailed in individual contract documents.

Detector pits and detector pit covers shall be constructed and installed in accordance with Standard Drawings TC‑1310 and TC‑1320.

Where a detector pit is installed within a grassed area with no kerbing, a round concrete collar shall be installed around the pit. The collar shall be a minimum of 200mm wide at the narrowest point and a minimum of 100mm thick.

The pit cover shall be securely fixed to the pit using the fixing device supplied.

Detector pits shall be located so as to ensure adequate separation between pits and other features such as expansion joints, drainage, electrical or communication pits, culverts, etc.

**733.11 CLEANING OF SITE**

Surplus excavated material shall be removed from the road reserve. Areas affected by the work shall be restored to a condition similar to that which existed prior to the commencement of the work.

**733.12 IDENTIFICATION AND RECORDING**

All conduit locations not identified by pits immediately installed at the ends shall be marked with 75 x 38 mm stakes projecting 0.4 m above the ground, with the top 150 mm painted yellow stakes, or as otherwise agreed by the Superintendent. Conduits under road pavement shall be marked with stakes clear of the road pavement. Conduits not under road pavement shall be marked with stakes at the ends, at changes of direction, and at intervals of not more than 30 m. This staking will be additional to any marker pegs to which draw cords are tied.

Unless otherwise specified, the actual installed location and depth of conduits, and location of pits, shall be accurately recorded on As-built drawings in a format agreed by the Superintendent.

**733.13 DOCUMENTATION**

All documentation relating to conduit and pit installation required under the contract specific requirements shall be provided. Notwithstanding the contract specific documentation requirements, the contractor shall provide, as a minimum, the following:

1. ‘As-built’ drawings showing the complete conduit network including conduit types, sizes and depths.
2. The above ‘As-built’ drawings shall also show all pits, pit types and pit sizes.
3. Certificates of electrical safety for all conduits and pits installed.
4. Documentation demonstrating that all pits and conduits installed, have been installed in accordance with the requirements of this specification.