SECTION 733 - CONDUITS AND PITS FOR UNDERGROUND WIRING AND CABLING

733.01 DESCRIPTION

This section covers the supply and installation of conduits and pits, as necessary to provide for underground electrical wiring and communications cabling, as shown on the drawings, or as specified.

733.02 MATERIALS

(a) Conduits

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

AS/NZS 1477, AS/NZS 2053, AS/NZS 4130

Unless otherwise approved by the Superintendent, all conduits installed underground for electrical wiring, traffic signals and traffic services shall be heavy duty grade, rigid orange, UPVC conduit to AS/NZS 2053.2; or Profile wall-smooth bore HD UPVC conduit to AS/NZS 2053.6.

Unless otherwise approved by the Superintendent, all conduits installed underground for communication cables shall be heavy duty grade, rigid white UPVC communication conduit complying with AS/NZS 2053.2; or Profile wall-smooth bore HD UPVC conduit to AS/NZS 2053.6; and complying with all relevant Australian Communications and Media Authority (ACMA) publications and standards.

(b) Conduit Sizes

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

Conduit sizes for VicRoads traffic signals, street lighting and traffic services shall be in accordance with the relevant VicRoads specifications, guideline and standard drawings listed in Table 733.021.

Table 733.021

Installation Type	Specification / Guideline / Drawing Number
Traffic signals	TCS 013, TC-1207
Street lighting	TCG 006 ,TC-1207, TC-1062, TC-1071, TC-1072
Consumers mains	TC-1206
Trunk conduit system	TC-2001
Freeway camera site	TC-2011
Freeway help phone site	TC-2021
Freeway data station site	TC-2031

(c) Bedding and Backfill Materials

Unless otherwise specified, the Contractor shall supply all bedding and backfill material in accordance with the requirements of Clause 733.06.

(d) Pits

Unless otherwise specified, the Contractor shall supply all pits and lids in accordance with the requirements of Clauses 733.07 and 733.08.

733.03 EXCAVATION, BORING AND TRENCHING

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

Detailed proposals for boring under carriageways shall be submitted to the Superintendent for review two weeks prior to the programmed commencement of work.

Unless otherwise specified, boring by water jetting will not be permitted.

Unless otherwise specified, the annulus between the bore and the carrier-conduit shall be filled by pressure grouting.

Unless otherwise shown on the drawings or specified, borings and trenches shall comply with the following depth requirements:

(a) Where conduits are laid under carriageway pavements, the minimum cover from top of conduit to the pavement surface shall be 1200 mm for freeways and arterial roads, and 600 mm for local roads. The minimum cover from top of conduit to the invert level of open drains shall be 750 mm.

(b) Where conduits are laid under footpaths or under unpaved areas, the minimum cover from top of conduit to the surface shall be 600 mm for low voltage circuits and 300 mm for extra low voltage circuits and communications cabling.

(c) Where conduits are laid under tram tracks, the minimum cover from top of conduit to the track surface level shall be 1200 mm.

(d) Where conduits are laid under railway-road crossings, the minimum cover from top of conduit to track surface level shall be 2000 mm. The conduit installation shall meet the requirements of the relevant rail authority. An underground conduit warning sign shall be installed in accordance with VicRoads Standard Drawing TC-1208.

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.

Adequate drains to approved outlets shall be provided from junction pits.

Trenches shall be graded to allow condensation and seepage to flow from conduits to the outlet provided.

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

733.04 INSTALLATION OF CONDUITS

All conduits shall be installed as shown on the drawings, or as 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).

All conduit installation works for electrical wiring and communications cabling shall be carried out by, or under the direct supervision of, appropriately registered and licensed personnel provided by the Contractor.

All conduit installation works for electrical wiring shall be carried out by, or under the direct site supervision of, a registered electrical contractor as required by the Chief Electrical Inspector. In addition, the registered electrical contractor shall hold appropriate VicRoads pre-qualification for the work specified.

Installation of conduits shall be carried out in accordance with the approved installation method for the type of conduit as shown in Table 733.041.

Table 733.041

Conduit Type	Installation Method
HD UPVC Plain	Thrust bore Open trench
HD UPVC Profile wall-smooth bore (100 mm only)	Open trench
HDPE continuous (must have ID not less than that of 100 mm HD UPVC)	Directional Bore

Conduits for VicRoads traffic signals and traffic services shall be installed to the following requirements:

(a) all conduits shall terminate in a pit in accordance with VicRoads Standard Drawing TC-1207;

(b) only one size conduit shall be used for a complete run between pits; unequal size conduits shall not be joined in the ground;

(c) all conduits shall be temporarily sealed prior to cabling to avoid blockage;

(d) changes in conduit direction or depth shall be made by natural set or in the case of bottom entry, by means of a swept bend; elbows or tees shall not be used;

(e) all conduit joints shall be correctly prepared and sealed with approved solvent cement;

(f) conduits for detector cables shall be installed as shown in VicRoads Standard Drawings TC-1207 and TC-1320; and

(g) 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 VicRoads Standard Drawing TC-1207.

733.05 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. 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.

733.06 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 733.061.

Table 733.061

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	-	10-40	2	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

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.

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.

(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:

(i) 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.

(ii) 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.

(iii) 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 to refusal using hand held mechanical plant.

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 **– REFER TO TENDER DRWAINGS**

~~Pavement Layer~~	~~Material Type~~	~~Thickness (mm)~~
~~##:~~		

733.07 CABLE PITS AND PIT LIDS

Cable pits shall be constructed and installed as shown on the drawings, at the terminal of conduits, or as specified.

Cable pits for traffic signal installations shall be constructed and installed in accordance with VicRoads Standard Drawings TC-1210, TC-1220 and TC-1230.

Pits shall be constructed such that the level of the top of the pit lid in place matches the surrounding finished surface level. The top of the pit wall shall be neatly finished such that the lid fits without movement.

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 the area between the conduit and pit wall stopped with cement mortar.

Heavy duty pit lids shall be provided where the pit is located in a road pavement.

All cable pit installation works for electrical wiring and communications cabling shall be carried out by, or under the direct supervision of, appropriately registered and licenced personnel provided by the Contractor.

All cable pit installation works for electrical wiring shall be carried out by, or under direct site supervision of, a registered electrical contractor as required by the Chief Electrical Inspector. In addition, the registered electrical contractor shall hold appropriate VicRoads pre-qualification for the work specified.

733.08 DETECTOR PITS FOR TRAFFIC SIGNALS

Detector pits for traffic signals shall be installed as shown on the drawings, or as specified.

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

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.

733.09 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.

733.10 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-constructed drawings in a format agreed by the Superintendent.