Manual

Traffic and Road Use Management
Volume 4 – Intelligent Transport Systems and Electrical Technology

Part 4: Road Lighting Dome Junction Box Assembly

March 2021

Queensland Government

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Contents

1 Introduction

The purpose of this technical instruction is to detail the installation and maintenance of a road lighting dome junction box used by the Department of Transport and Main Roads.

In this version, the "Main Earth Conductor Label – Junction box end" was removed from Table 4. And also, Figure 12.1(a): "One hole 'Main Earth DO NOT DISCONNECT' warning label" in Section 12.1 relating to the same label was removed.

The function of the road lighting junction box is to house the wiring connections in the electrical system of road lighting installations. This device also acts as a switchboard by providing flexibility to connect or isolate the circuit at every node for both single- and three-phase circuits as detailed in Standard Drawings 1624, 1625, 1626 and 1699.

All electrical works shall comply with the requirements of the *Electrical Safety Act 2002*.

2 Definition of terms

Term	Definition
Approved heat source	Hot air gun or soft butane gas gun with flame approximately 300 mm long and with a 200 mm soft yellow tip
Nm	Newton metre
The Act	*Electrical Safety Act 2002*, Regulation and Codes of Practice

3 Referenced documents

The table following lists the references included in this document.

Table 3 – Referenced documents

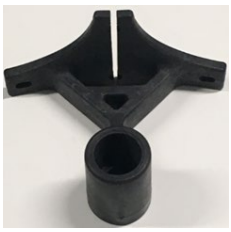
Reference	Title
AS/NZS 3000	*Electrical installations* (known as the Australian / New Zealand Wiring Rules)
MRTS228	*Electrical Switchboards*
Standard Drawing SD1624	*Road lighting – Junction box single-phase wiring details*
Standard Drawing SD1625	*Road lighting – Junction box three-phase wiring details*
Standard Drawing SD1626	*Road lighting – Junction box active, neutral and earth bolting arrangements*
Standard Drawing SD1699	*Traffic signals / Road lighting / ITS – Parts list*

4 Items included in the kit

The items included in the road lighting dome junction box assembly kit are as shown in Table 4. Ensure all the kit contents are available.

The "Main Earth Conductor Label – Junction box end" was removed from Table 4.

Table 4 – Items included in junction box assembly kit (clear dome added, mounting bracket and base changed)

Dome		Sealing clamp	
Sealing O-Ring		Heatshrink Sleeves	
Base		Mounting Bracket	
Cleaning Sachet		Branch Clip	
Instruction Guide		Sealing Tape	

Abrasive Strip		Gel cap with clamp	
Main Earth Conductor Label – Junction box end		Main Earth Conductor Label – pole end	
Fuse holder, Fuse & Padlock		Main switch Label Fitted to Isolator as per AS/NZS 3000 – *Wiring Rules*	
Neutral Connector kit		Active Connector	
2 Part Resin		Gel mixing bag	

5 Prepare entry ports

Figure 5 – Prepare entry ports

CLEAN – Knock out enclosure ports as required and wipe ports with a clean cloth.

ABRADE – Use abrasive strip to roughen outside of the ports horizontally to ensure secure adhesion of heat shrink.

PRE HEAT – Preheat port using approved heat source.

6 Install heat shrink sleeves onto base

Figure 6 – Install heat shrink sleeves onto base

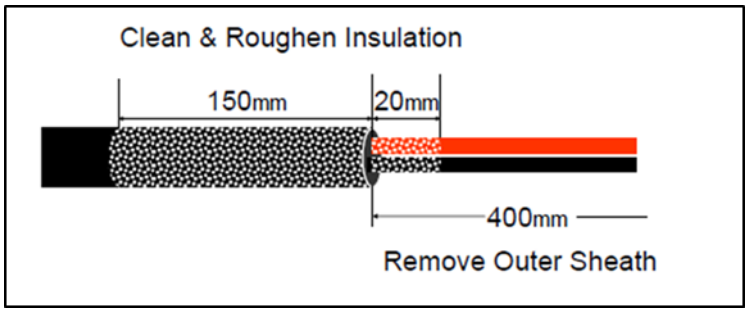
SLEEVE – Slide the glue-free end of the heat-shrink sleeve onto the prepared port.

HEAT – Using an approved heat source, gently heat the glue-free end of the heat shrink, taking care not to concentrate the heat in one spot and ensuring the section with the glue is not heated.

COOL – Allow cooling for 10 minutes before installing cables.

7 Prepare cable

Figure 7– Prepare cable to be inserted into junction box



7.1 XLPE cable

CLEAN – Clean cable for 500 mm using clean cloth.

REMOVE SHEATH – Remove 300 mm of outer sheath.

WIPE – Wearing polythene gloves provided, use the alcohol wipe from sachet to clean cable 150 mm back from the sheath cut and 20 mm onto the conductor insulation.

ROUGHEN – Lightly roughen 150 mm of outer insulation with abrasive tape to aid sleeve adhesion.

7.2 HDPE cable

CLEAN – Clean cable for 600 mm using a clean cloth.

REMOVE SHEATH – Remove 300 mm of outer sheath.

WIPE – Wearing polythene gloves provided, use the alcohol wipe from sachet to clean cable 150 mm back from the sheath cut and 20 mm onto the conductor insulation.

ROUGHEN – Lightly roughen 150 mm of outer insulation with abrasive tape to aid sleeve adhesion.

7.3 Earth cable

CLEAN – Clean cable for 600 mm using a clean cloth.

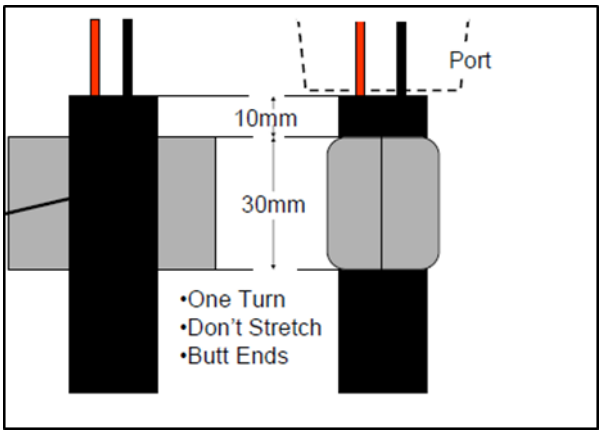
WIPE – Wearing polythene gloves provided, use the alcohol wipe from sachet to clean cable 400 mm of the insulation.

ROUGHEN – Lightly roughen 150 mm of outer insulation with abrasive tape to aid sleeve adhesion.

8 Apply grey sealant to cables

8.1 All power cables

Figure 8.1 – All power cables



CUT TAPE – Cut the sealant tape to fit one turn around cable.

APPLY TAPE – Apply tape to sheath 10 mm back from cut.

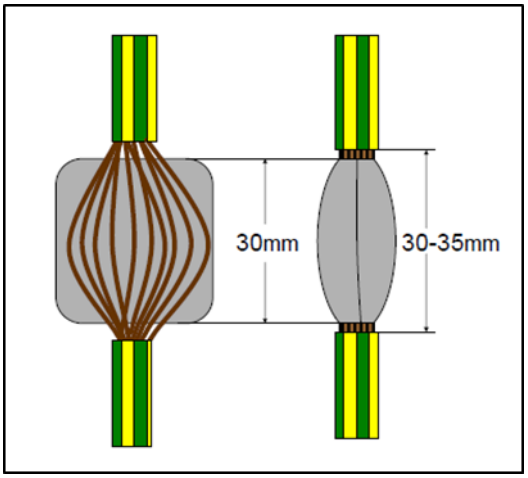
DO NOT STRETCH – Do not stretch sealant tape.

BUTT ENDS – Butt ends of tape together without overlap.

REMOVE AIR GAPS – Remove any air gaps or pathways by gently pressing tape.

8.2 Earth cable

Figure 8.2 –Earth cable



REMOVE INSULATION – 400 mm from the end of the cable, remove a 40 mm of green / yellow insulation exposing a 30–35 mm section of copper strands.

ROUGHEN – Lightly roughen 110 mm of insulation back from cut using abrasive tape.

SPREAD CONDUCTORS – At exposed section, flatten and spread out earth cable conductor strands at 30–35 mm section to allow grey sealing tape to be worked in between strands.

CUT TAPE – Cut the sealant tape to size, then position in the centre of 30–35 mm section (tape width <30 mm).

APPLY TAPE – Wrap one turn of grey sealing tape around exposed section, working it between the strands to make a watertight seal.

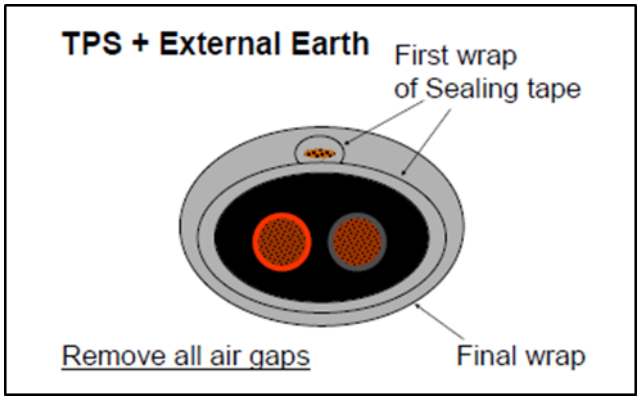
DO NOT STRETCH – Do not stretch sealant tape.

BUTT ENDS – Butt ends together without overlap.

REMOVE AIR GAPS – Remove any air gaps or pathways by gently pressing tape.

8.3 Power and earth cables

Figure 8.3 – Road lighting and external earth cable



PLACE CABLES – Place the sealed sections of the earth and power cables together and press.

WRAP – One final wrap around both taking care to squeeze and smooth air paths out of taped sections.

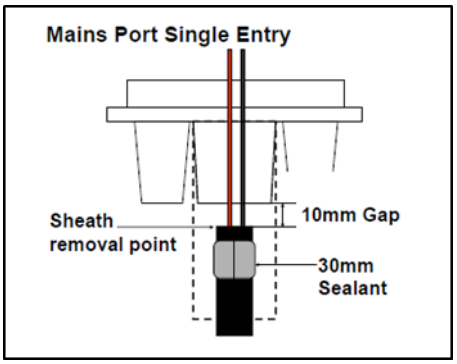
DO NOT STRETCH – Do not stretch sealant tape.

DO NOT OVERLAP – Do not overlap ends of grey tape.

9 Install cables in ports

9.1 Mains port – single entry (large)

Figure 9.1 – Mains port – single entry (large)

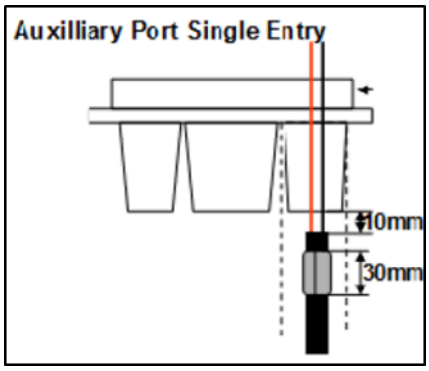


APPLY TAPE – Apply sealant tape to outer insulation.

INSERT CABLE – Place mains cable into enclosure through heat shrink sleeve, allowing a 10 mm gap from sheath cut-off point to port opening to allow for upward cable movement during heating.

9.2 Auxiliary port – single entry (small)

Figure 9.2 – Mains port – single entry (small)

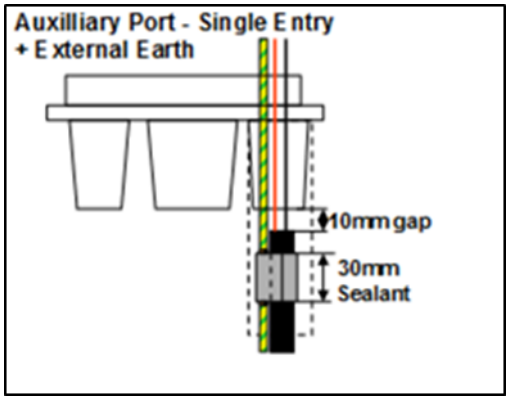


APPLY TAPE – Apply sealing tape to outer sheath.

INSERT CABLE – Place cable into enclosure through heat shrink sleeve allowing a 10 mm gap from sheath cut-off point to port opening to allow for upward cable movement during heating.

9.3 Auxiliary port – single entry + earth (small)

Figure 9.3 – Mains port – single entry + earth (small)

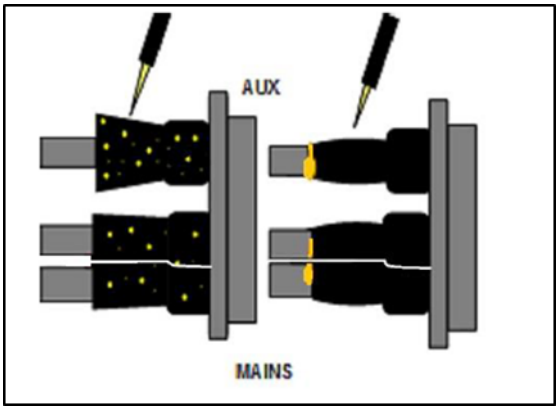


COMBINE CABLES – The external earth cable must be installed along with a TPS cable.

INSERT CABLES – Place both cables into enclosure through heat shrink sleeve, allowing a 10 mm gap from sheath cut-off point to port opening to allow for upward cable movement during heating.

10 Heating heat shrink sleeve

Figure 10 – Sleeve recovery



SECURE BASE – Secure base to a stable support.

SECURE CABLES – Secure cables in place to prevent movement (cable ties or electrical tape).

HEAT – Start to heat sleeve with an approved heat source from the enclosure base moving outwards, ensuring heat is evenly distributed and not concentrated in one spot. Apply heat until the markings on the heat shrink sleeve fade and melted glue appears at the bottom of the sleeve.

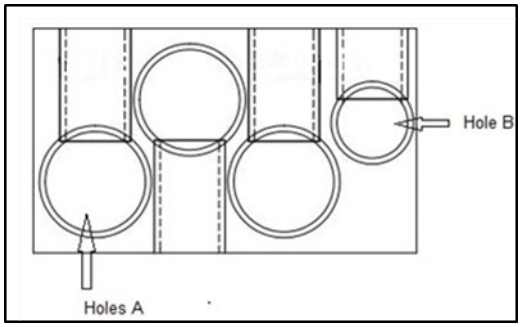
COOL – Allow heat shrink to cool down.

PREPARE CONDUCTORS – Prepare conductors for termination while heat shrink is cooling down.

11 Installation instructions – active joint

11.1 Active connector

Figure 11.1 – Active connector



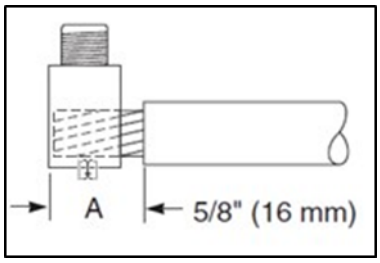
SELECT HOLE – Select hole in connector to suit cable size.

‘Holes A’ can accommodate cables 16–35 mm²

‘Hole B’ can accommodate cables 2.5–6 mm².

11.2 Remove insulation and make connection

Figure 11.2 – Make connection



REMOVE INSULATION – Insulation removal length equals connector insertion depth (16 mm), allowing gap between insulation and connector.

INSERT CONDUCTORS – Insert conductors into connector

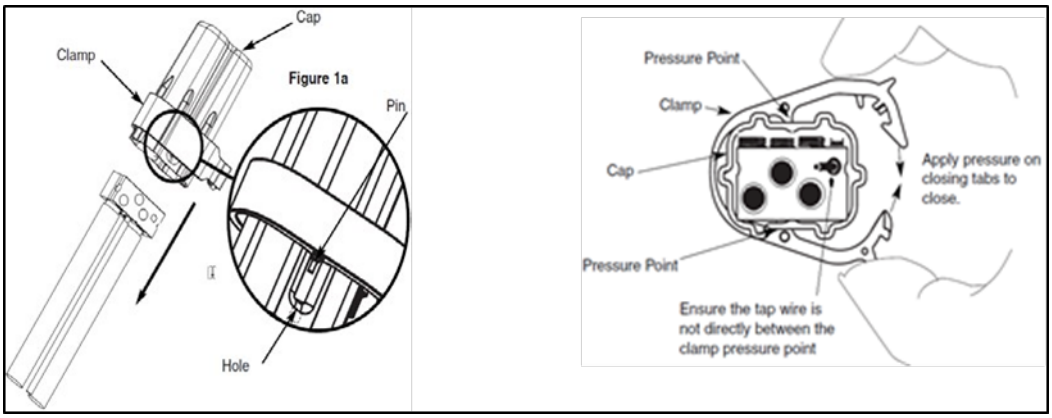
TIGHTEN SCREWS – Using a torque wrench, tighten screws to the appropriate torque value.

Hole A: 3 Nm

Hole B: 3 Nm

11.3 Push sealing cap onto connection

Figure 11.3 – Sealing cap



INSTALL CAP – Install cap by holding all wires and pushing the cap over the connection assembly until it goes no further.

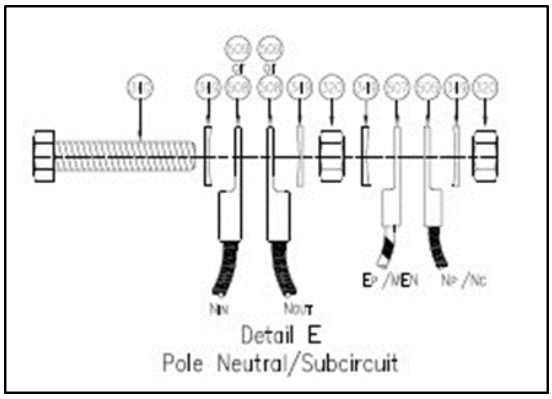
INSTALL CLAMP – Install clamp on cap. Verify proper placement of clamp by ensuring the two pins on the bottom edge of the clamp are mated with the holes of the cap, as shown in the figure following.

APPLY PRESSURE – Apply pressure to close, using pliers if necessary. Clamp pressure points should fit into opposing grooves of cap and apply pressure between the cables.

NOTE: Ensure that the interface between the copper conductor and the insulation is concealed within the sealing cap gel.

12 Installation instructions – neutral joint

Figure 12 – Neutral and earthing bolting arrangements



12.1 Remove insulation and install lugs

REMOVE INSULATION – Remove sufficient insulation so that the copper extends fully into lug, ensuring the insulation does not extend into lug (1 mm clearance).

SELECT CRIMPING TOOL – Select correct crimping tool for secure connection.

INSTALL LUGS – Install crimp lugs onto conductor.

BOLTING ARRANGEMENTS – Install neutral and earth bolting arrangements required as per Standard Drawing SD1626. Use Belleville washers for spacers if required.

Note that setscrew lengths vary – see bolting details.

ARRANGE WIRING – Arrange the wiring neatly within the joint, using cable ties if necessary. Leads must run parallel for at least 40 mm to accommodate the insulating shroud.

TIGHTEN NUTS – Torque all nuts on setscrew assembly to a minimum of 20 Nm.

Figure 12.1(a): "One hole ‘Main Earth DO NOT DISCONNECT’ warning label" was removed. Figure 12.1(b) is now Figure 12.1.

Figure 12.1 – ‘Main Earth DO NOT DISCONNECT’ warning label

NOTES

1. Do not connect Multiple Earthed Neutral (MEN) connection until earth continuity and polarity is established.
2. Place the top hole of the ‘Main Earth DO NOT DISCONNECT’ warning label (refer Figure 12.1) over the earth conductor in the bell joint prior to bolting the lugged joint together.
3. Place a 'Main Earth DO NOT DISCONNECT' warning label (refer Figure 12.1) on the earth cable where it terminates to the earth electrode at the pole.

12.2 Push sealing cap onto connection

NOTE – This is the same process as with active joint.

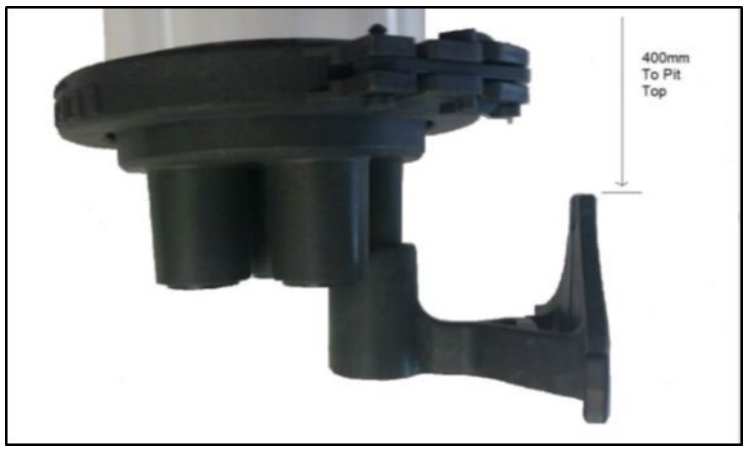
INSTALL CAP – Install cap by holding all wires and pushing the cap over the connection assembly until it goes no further.

INSTALL CLAMP – Install clamp on cap. Verify proper placement of clamp by ensuring the two pins on the bottom edge of the clamp are mated with the holes of the cap, as shown in the figure following.

APPLY PRESSURE – Apply pressure to close, using pliers if necessary. Clamp pressure points should fit into opposing grooves of cap and apply pressure between the cables.

13 Install bracket

Figure 13 – Supporting bracket



INSTALL BRACKET – Install joint enclosure support bracket on the inside wall of the pit at a height to allow clearance from pit lid (recommended 400 mm from top of pit to top of bracket).

INSTALL JOINT – Once the bracket is installed, install the joint base on the bracket. This will provide a stable support for the installation of the sealant.

FINALISING – Ensure the cables and terminations are neatly together and the earth label is clearly visible.

14 Installing sealant

Figure 14 – Sealant application to enclosure ports

14.1 Apply sealant to enclosure ports after termination

SEAL PORTS– After termination of the cables, the ports must be sealed with a two bottle sealant - a clear solution and a blue solution.

MIX SEALANT – Pour all of the clear solution and blue solution into the gel mixing bag.

SHAKE – Immediately shake the mixture vigorously for 20 seconds until well combined.

POUR IMMEDIATELY – Apply liquid sealant by pouring into ports, being careful not to overfill ports and flood the base.

CAUTION – Be careful not to move the cables around in the sealant prior to it setting to avoid compromising the seal.

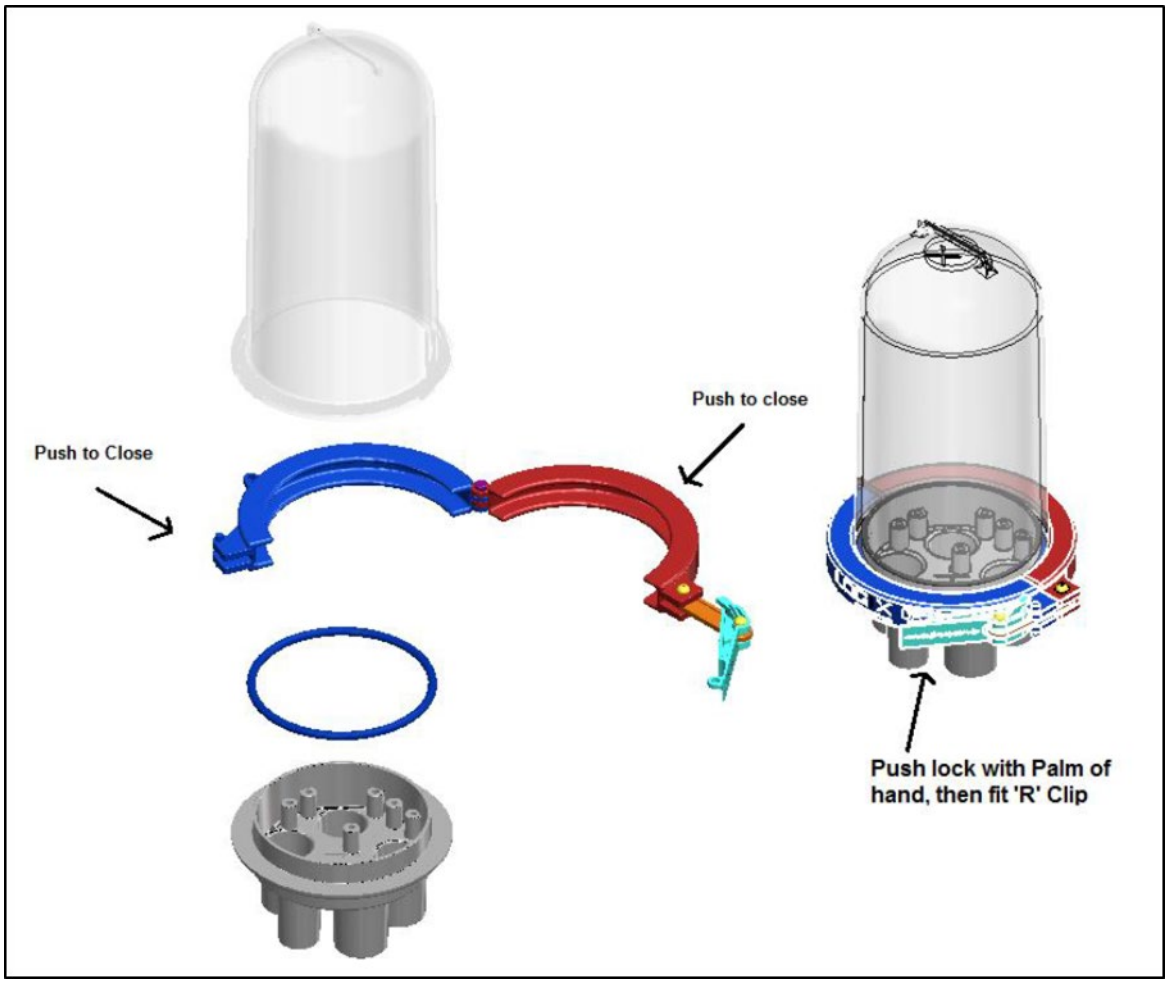
NOTE - At an ambient temperature of 25°C, the solution will take approximately 15–20 minutes before it starts to congeal. Curing time is faster at warmer ambient temperatures, and slower at lower ambient temperatures.

14.2 Sealant safety directions

- Avoid contact with skin and eyes.
- Wear protective gloves and safety glasses.
- If poisoning occurs, contact a doctor or Poisons information centre.
- If swallowed, do not induce vomiting. Seek immediate medical attention.
- If in eyes, rinse eyes with water.
- If on skin, wash with soap and water.

15 Closing joint

Figure 15 – Closing joint closure



SEALANT SET – After the sealant is set, the joint can be closed.

O RING – Install the O ring on the base.

DOME – Place the dome onto the base, install the sealing clamp around the dome and base and secure.

16 Completion

SUPPORT BRACKET – Fix dome in support bracket in pit.

INSTALL LID – Place the pit lid back onto the pit.

EARTH LABEL – Ensure the two-hole earth label is connected to the pole earth cable adjacent to the terminal.