



## Requirements for Working in the Vicinity of Transgrid Underground Cables

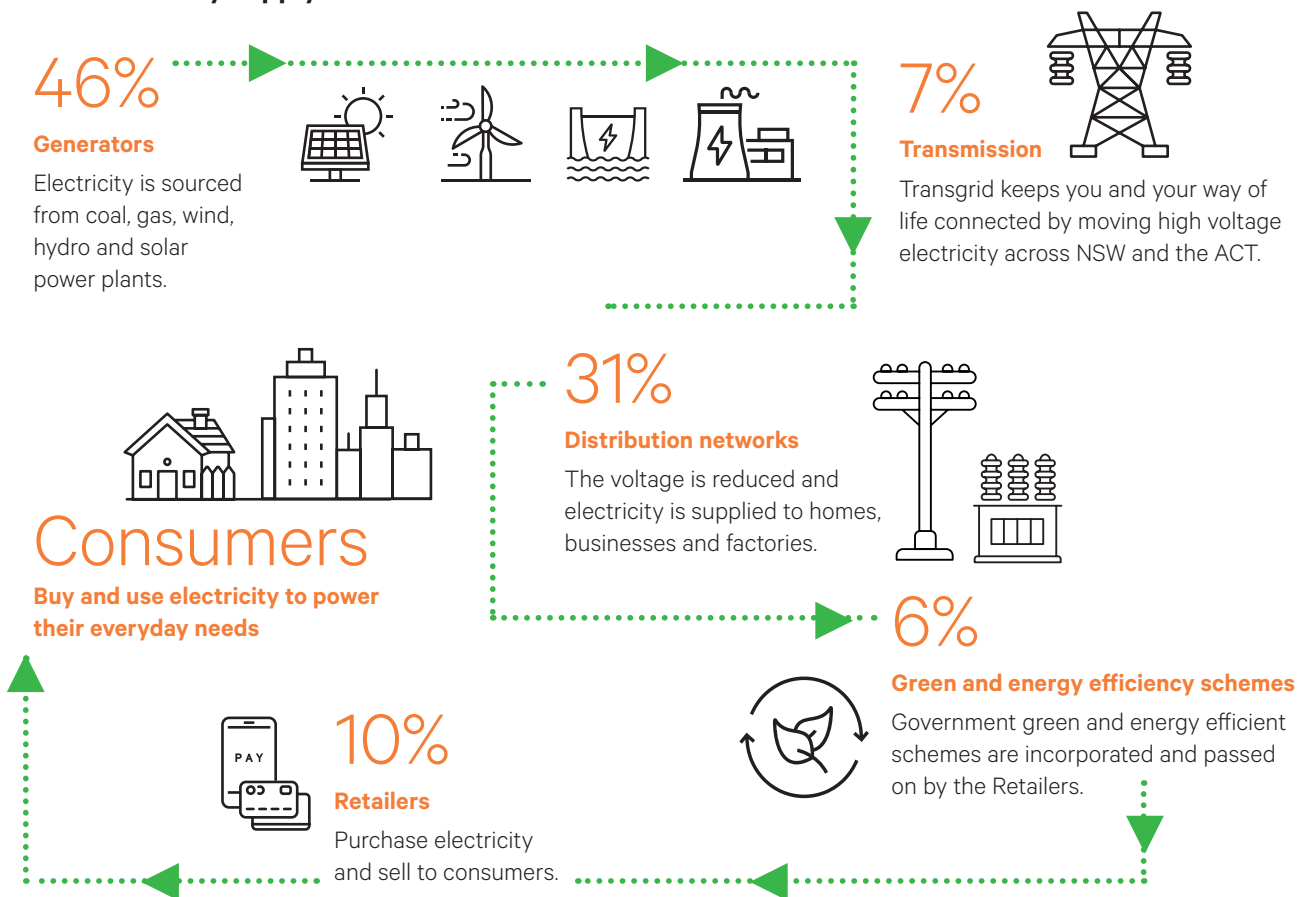
# 1. Introduction

**Transgrid is the operator and manager of the NSW high voltage electricity network. Transgrid is responsible for the transmission of high voltage electricity from generators to distributors such as Ausgrid and Endeavour Energy.**

Transgrid's high voltage 330,000 kV underground cables, supply Sydney with electricity and damage to these cables could lead to serious injury or death and widespread electricity supply interruptions, including Sydney CBD.

Transgrid power cables are located in public roadways, council parks, private property and government corporation land, such as Sydney Water and Sydney Trains. Great care must be exercised when working in the vicinity of these cables.

## The electricity supply chain



Transgrid was formerly known as the Electricity Commission of NSW (ELCOM), Pacific Power and PacificGrid. Transgrid is a separate organisation to Ausgrid (formally Energy Australia), Endeavour Energy (formally Integral Energy) and Essential Energy (formally Country Energy), and does not represent the views or opinions of these other entities.

## 2. Definitions

### DBYD

Dial Before You Dig.

### Zone of Influence

This area is at least two metres from the extremities of the cable trench and increases with depth. This zone is shown as 'Z' on Attachment 1, page 11.

### Joint Bay

High voltage underground power cables are jointed in buried concrete joint bays (vaults). The joint bays provide both a physical protection barrier and a stable environment to prevent movement of the cable joints. A typical joint bay measures 14-25m long by 2-3m wide and 2m deep. The walls and floor are constructed of 150mm thick reinforced concrete. The walls extend to within 400mm of the finished ground surface. There are no surface markers indicating the location of joint bays. No excavation is permitted in the joint bay.

### Underground Pits

Generally, underground pits are within 10 metres of a joint bay wall. These pits can be identified by the presence of steel Gatic covers. These pits are typically referred to on drawings as: Link Box Pit, Optical Fibre Pit, Bypass Valve Pit, Gauge Panel Pit, DC Blocker Device Pit, Tank Pit, DTS Calibration Pit, CMS/OFC Jointing Pit, Gauge Panel Chamber and Ambient Temperature Sensor. All pits have cables or pipes connecting them to the joint bay.

### Cable Trench

The dimension of any high voltage power cable trench varies depending upon the burial depth (D) and phase spacing (S) of the power cables. Thermally controlled bedding mix (14:1 sand cement) surrounds the cables between the trench floor and concrete slabs. No excavation is permitted within the 14:1 Sand / Cement mix shown in Attachment 2, page 11.

### Terminology used on Route Plans

These terms are generally not included on the drawing legend.

|                   |                                                                                                                                        |
|-------------------|----------------------------------------------------------------------------------------------------------------------------------------|
| JB                | Joint Bay                                                                                                                              |
| TR                | Thermal Resistivity (a measure of soil quality which influences the width of the trench)                                               |
| Cover or cov.     | The distance between the top of the cable and the ground level                                                                         |
| RC                | Reinforced Concrete                                                                                                                    |
| BL                | Building Line or Building Alignment or Property Boundary (most measurements are taken from this line – not the kerb, unless specified) |
| LB                | Link Box                                                                                                                               |
| Protective covers | Reinforced concrete slabs, measuring 1000 mm X 400 mm X 50 mm thick                                                                    |
| Ch.               | Chainage distance from the nearest joint on the source substation side                                                                 |
| Snaking           | Cable laid in a wave formation increasing the width of the trench                                                                      |

### 3. Working in the vicinity of underground power cables

During the planning phase of your project, it is essential to check for the presence of all underground services in the vicinity. This will enable you to take appropriate actions to avoid damage to these assets. Transgrid is a member of Dial Before You Dig (DBYD) and will respond to all enquiries regarding the location of its underground assets.

**No excavation work is to commence until Transgrid has responded to your DBYD enquiry.**

This is a requirement by law under Section 63Z of the *Energy Supply Act 1995*. Breach of the *Electricity Supply Act 1995* may result in civil and criminal penalties, including substantial fines.

Work in the vicinity of underground cables must be performed in accordance with the requirements as detailed in this document or as directed on-site by the Transgrid site representative. Where required, Transgrid provides a site representative to advise non-Transgrid staff on the most appropriate work methods to employ when working in the vicinity of Transgrid power cables. The Transgrid site representative is provided at zero cost to the contractor.

Contractors will still be liable for their own actions even if Transgrid staff are present.

For the purpose of this document, work means any of the following activities:

- Any work which raises or lowers the ground surface level above or within two metres of either side of the cable trench
- Any work that impedes the free flow of air over the cable trench, i.e. storage of materials or other structures that contact the ground surface
- Any work within two metres of any underground pit or joint bay (vault) or any work that prevents access to underground pits or vaults
- Below surface level excavations that come within the zone of influence of the power cables
- Excavation which could result in movement of the sub-soil from either poor compaction of materials or water flows
- Road boring works where the bore may pass within five metres of any cable or associated plant
- Any other work not covered by the above criteria which could cause adverse impact upon the cables or associated plant such as:
  - Crush damage from heavy machinery
  - Washout or scouring of the cable trench
  - Collapse of cable trench or
  - Undermining of above-ground structures.



## 4. Underground cable location

Before digging or boring into unknown ground, it is essential to check on the location of any underground cables in the vicinity of the proposed work.

All persons proposing excavation work deeper than 150mm (300mm without machinery or power tools) are required to contact DBYD before commencing work.

To determine if cables or associated assets (or other services) exist in any particular location contact DBYD by telephoning 1100 or website 1100.com.au. This is a free service providing information on which utility has underground services in a particular location and provides the relevant contact details for these utilities.

### Location of cables on plans

Transgrid's plans have been prepared solely for our own use. Therefore, Transgrid can accept no liability for inaccuracies in the information shown on the plans.

All reasonable care is taken to ensure that the location and depth of cables and conduits are shown correctly on the plans provided. However, reference points may change and subsequent works may have altered ground surface levels, road widths, road levels, kerb and fence alignments.

Please note that on these drawings, streets are shown at the private property boundary (not the kerb and gutter, unless otherwise stated); and the typical 1200mm wide cable trench is shown as a mean dashed line in 'CAB' drawing and a mean single line in the 'SYS' drawing.

The provision of drawings as part of a DBYD does not diminish your obligations under NSW legislation, including any requirement to contact Transgrid prior to work commencing to discuss any necessary safety aspects and work methods.

### Roadways

Where roadside kerbs are available, highly visible tiles (yellow background and black lettering) are attached to the vertical plane of the kerb. In other locations, the tiles are attached to the most suitable surface in close proximity to the cable location.

### Other than roadways

Where cables are installed outside of public roadways, marker posts or ground level plaques are generally installed over the cable trench centre line.

Care and caution should be shown when working in the vicinity of power cables. The position (or absence) of markers cannot be taken as proof of the exact position of the power cables. For confirmation of exact position of cables, contact Transgrid on 02 9620 0422.

If you observe Transgrid markers in the vicinity of your proposed work Transgrid can be contacted directly on 02 9620 0422. The Transgrid 24 hour Emergency Hotline is 1800 027 253.

You must always complete a DBYD enquiry regardless of the presence (or absence) of cable markers.

### Cable markers

Transgrid uses various indicators to identify the location of its underground cables. These identifiers include posts, kerbside markers and plaques.



Cable marker post



Kerbside marker



Below ground concrete cable cover slabs



Plaque in non-road area

## 5. Conditions of working in the vicinity of Transgrid underground cables

All persons planning to dig in public roadways, including unsealed or unformed sections, must obtain approval under *Roads Act 1993* before opening of any roadway.

### 5.1 Separation distances of Transgrid cables to other utility services

This table applies for services less than 300mm diameter. Larger services to be negotiated with Transgrid.

| Utility        | Service Type                  | Distance:<br>Parallel Clearance (C) | Distance:<br>Transverse Under (M) | Distance:<br>Transverse Above (P) |
|----------------|-------------------------------|-------------------------------------|-----------------------------------|-----------------------------------|
| Gas            | LP Nylon                      | 0.5 m                               | 0.5 m                             | 0.5 m                             |
|                | HP Steel Mains                | 4.0 m                               | 1.0 m                             | 1.0 m                             |
| Electricity    | HV & LV<br>Distribution Mains | To be negotiated                    | To be negotiated                  | To be negotiated                  |
|                | LV Consumer Mains             | 1.0 m                               | 1.0 m                             | 0.5 m                             |
| Water          | LP Water Main                 | 1.0 m                               | 0.6 m                             | 0.6 m                             |
|                | HP Water Main                 | 2.0 m                               | 1.0 m                             | 1.0 m                             |
|                | Sewer                         | 1.0 m                               | 0.6 m                             | 0.6 m                             |
| Drainage       | RC Concrete                   | 1.0 m                               | 0.5 m                             | 0.6 m                             |
| Communications | All                           | 1.0 m                               | 0.6 m                             | 0.5 m                             |

Note: For dramatic view of clearances, see Attachment 1, page 11.

### 5.2 Responsibilities

It is the responsibility of the contractor to ensure that underground pits, ducts and cables are not damaged as a result of construction work. It is also their duty to protect their workers from harm or injury.

Working near a cable may result in electric shock even if no contact is made. Any work in the vicinity of any cable should only be performed using safe work methods developed in accordance with the recommendations included in WorkCover Code of Practice for Excavation and WorkCover Guide – Work Near Underground Assets.

#### Cable location enquiries

It is the contractor's responsibility to identify the presence of underground services prior to any below ground excavation work. Transgrid will provide plans of its services when requested and will provide a site representative at no cost, if warranted.

#### Identify cable location

It is the contractor's responsibility to identify the correct location of the cable trench and any associated plant (such as pits and joint bays etc), including depth, before commencing any machine work. This may be done with assistance of a Transgrid representative.

#### Safety

Transgrid accepts no responsibility or liability for any damage to property, machinery or personnel injury, as a result of any incident caused by other parties working on or in the vicinity of Transgrid assets. It is the contractor's responsibility to carry sufficient public liability insurance to cover any claim resulting from property damage or personal injury.

#### Traffic control

Transgrid accepts no responsibility for the control of traffic.

## Reinstatement of excavations

Reinstatement of works shall be carried out in accordance with the appropriate road owner's (Roads and Maritime Services) requirements and Transgrid's restorations requirements.

The restoration requirement is for stabilised backfill consisting of 20:1 sand cement to be installed and compacted in 300mm layers below the road pavement or as requested by the Transgrid representative.

## 5.3 Excavation or other work near cables

### Precautions

Due to the inherent dangers associated with excavations in the vicinity of underground power cables, precautions must be taken before and during any excavation works below the ground surface.

Precautions must include, but are not limited to the following:

- Transgrid requires notification at least two business days prior to the planned start of work in order to discuss necessary safety aspects, work methods and site supervision
- No work shall commence within the zone of influence of any Transgrid cables unless a Transgrid site representative is present
- Plans supplied by Transgrid shall be kept on the work site at all times whilst active work is performed
- Work method statements defining the limits of the excavations and the work procedures
- A hazard assessment must be carried out by the work crew prior to commencement of work, to ensure that:
  - all hazards have been identified and assessed
  - all members of the work crew have been made aware of the hazards
  - appropriate controls are in place to avoid the hazards identified
  - appropriate controls are in place to ensure the safety of the public
  - traffic management plans have been approved by the road owner.

## Machinery

The use of excavation machinery within the zone of influence is at the sole discretion of a Transgrid representative. Before the use of any machinery can commence, the cable locations must be positively identified by hand digging to the satisfaction of the Transgrid site representative. Where heavy 'crawler' or 'vibration' machinery are to operate above the cables, a minimum cover of 900mm to the cables is required. Where this cover is unachievable, Transgrid may require the use of heavy steel plates to distribute the load.

### Excavations

All excavations in close proximity to Transgrid power cables are to be adequately shored to satisfaction of the Transgrid representative to prevent the collapse of the power cable trench.

If the cable trench collapses then Transgrid must be immediately notified (refer to Chapter 7) and the trench restored to the satisfaction of the Transgrid representative.

Any damage to cable cover slabs, marker tapes or conduits during work must be restored prior to backfilling the excavation.

Where hand excavation is specified, hydro vacuum excavation may be used as an alternative, following written approval from a Transgrid representative. The working pressure of the excavator must not exceed 2,000 psi (13,790 kpa). This pressure should be lowered if gas mains are in the area.

The thermal operation of power cables is dependent upon the thermal conductivity of the soil surrounding the cable trench. Air pockets and spaces resulting from inadequate compaction result in a reduction in performance of the power cables.

Any ground disturbed within the zone of influence of a Transgrid power cable, or other excavation that could result in subsidence of the cable trench, must be restored to Transgrid specification, so as to maintain existing thermal properties.

You will be required to install and compact stabilised backfill consisting of 20:1 sand cement in 300mm layers or as requested by the Transgrid representative.

## **Danger**

Transgrid power cables are at a nominal voltage of 330,000 volts. Electricity at any voltage is extremely dangerous. Care should always be exercised whilst working in the vicinity of these power cables. Damage to power cables may result in:

- Loss of life or severe injury resulting from electric shock
- Loss of life or severe injury resulting from burns
- Interruption to electricity supply resulting in heavy compensation liability (may exceed your public liability cover)
- Financial responsibility for cost of repairs to damaged cable or cable accessories
- Damage to excavating equipment.

## **5.4 Boring**

The work methods for road boring, including directional bore, where the plant may pass within 5 metres in any direction of any cable or associated assets must be provided to the Transgrid representative for review and acceptance, prior to the commencement of work.

### **Traverse Bore**

Where the bore will cross the cables (transverse direction), the actual location of the cable trench must be first proven by hand digging.

### **Directional Bore**

After the cable trench has been located, a slip trench (minimum width 500 mm) is dug 2-3 metres parallel to the exposed cable trench from the side that the auger will approach.

The purpose of the slip trench is to expose the head of the auger before it is within 2 metres of the cable trench. Once the bore head is exposed, a Transgrid representative must confirm a satisfactory clearance before the bore continues.

The trench will extend a minimum 1 metre below the floor of the cable trench. No bore shall come within 1.5 metres of the power cables.

### **Rod borers and Grundomats**

These devices must be used boring away from the cable. The machine is set up on top or immediately

beside the cable trench. After the trench has been located by hand digging, excavate down to the cable slabs, set up on top of the slabs and bore away from the cable in each direction.

Some machines such as rod borers may be set up in a pit dug next to the cable trench, with the rods resting on top of the cable cover slabs.

### **Parallel Bore**

Where the bore is proposed parallel to the road kerb, the actual location of the cable trench must be proven by hand digging.

Transgrid cables are generally installed parallel to the roadside kerb but this must not be taken intersections.

### **The cable route must be confirmed from site plans.**

#### **a) Confirm trench location**

The location of the cable trench must be confirmed by hand excavation. The number of trial holes will depend upon the size of the bore and the separation distance.

As a guide, the minimum requirements shall be the commencement and end of the bore and at any change in direction of the cable trench alignment.

#### **b) Confirm accuracy of bore**

Where parallel bores are proposed to come within 2 metres of the cable trench, the accuracy of the bore must be confirmed during the whole boring exercise.

At intervals not exceeding 20 metres, or as directed by a Transgrid representative, transverse trenches are to be excavated, on the drill side of the cable trench from the edge of the cable trench for a distance of 2 metres. The depth of the trench must extend 1 metre below the floor of the cable trench.

The boring head of a drill must be tracked at all times to avoid encroaching upon the cable trench.

## **5.5 Explosives**

No explosives shall be used in the vicinity of any underground cables.

## 6. Installation of underground electricity cables

Installation of underground power cables near Transgrid cables can adversely impact its performance, as it may affect its ability to dissipate heat.

Negotiations for the intention to install these services must be initiated at least 3 months in advance of works. This is to allow Transgrid to perform thorough checks on the proposal.

The proposal should include engineering verification that the design has no detrimental effects on the Transgrid cable assets.



## 7. Damage to cables

Damage to Transgrid cable assets could lead to serious injury or death and widespread electricity supply interruptions in Sydney.

Under NSW legislation, Transgrid may recover costs from the contractor incurred:

- To replace any of Transgrid's electricity assets destroyed by the excavation work
- To repair any damage to Transgrid's electricity assets caused by the excavation work
- To remedy or mitigate any interference with Transgrid's electricity assets caused by the excavation work.

Any event of trench collapse or cable damage should be reported immediately to Transgrid's Emergency Hotline **1800 257 053** – any damage no matter how small or large should be reported, even though not immediately causing electrical failure.

## 8. Emergency excavations

If emergency excavation is being carried out in the vicinity of Transgrid assets, contact Transgrid as soon as practicable on 1800 257 053. A Transgrid representative will attend the site or provide any necessary assistance.



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## 9. Acts, regulations and guidelines

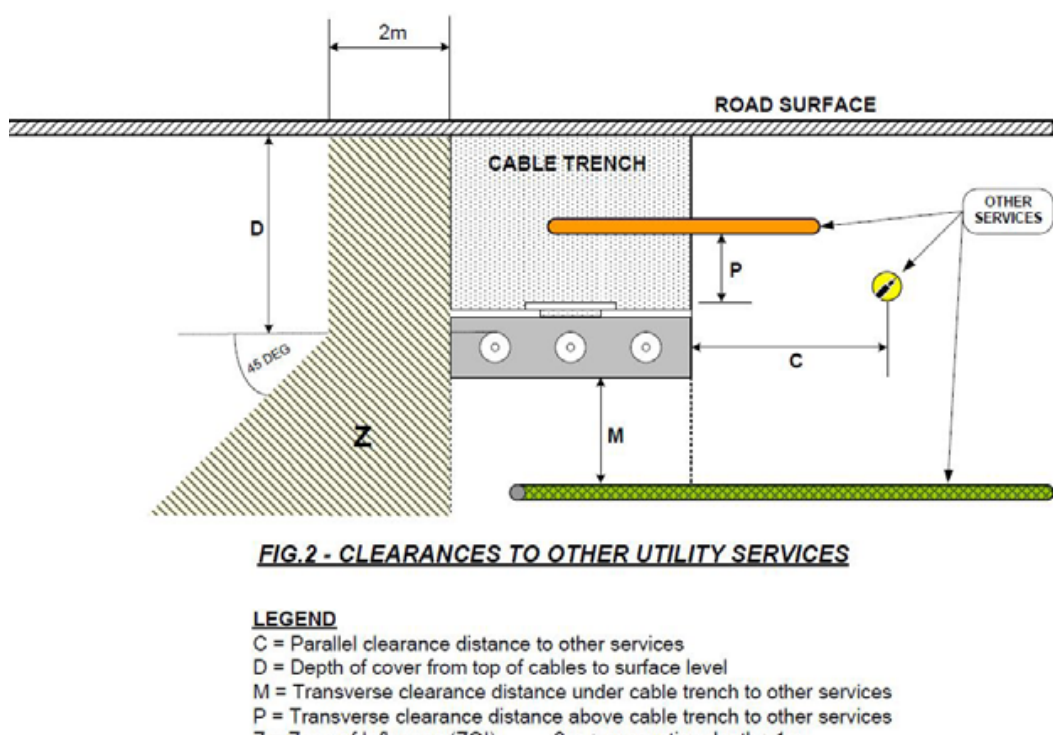
All work must be undertaken in accordance with the applicable laws and standards of the state of New South Wales, including:

- *The Electricity Supply Act 1995*
- *Work Health and Safety Act 2011* and associated Regulations
- *Electricity Safety Act 1945*
- WorkCover Work Near Underground Assets Guideline
- WorkCover Code of Practice for Excavation.

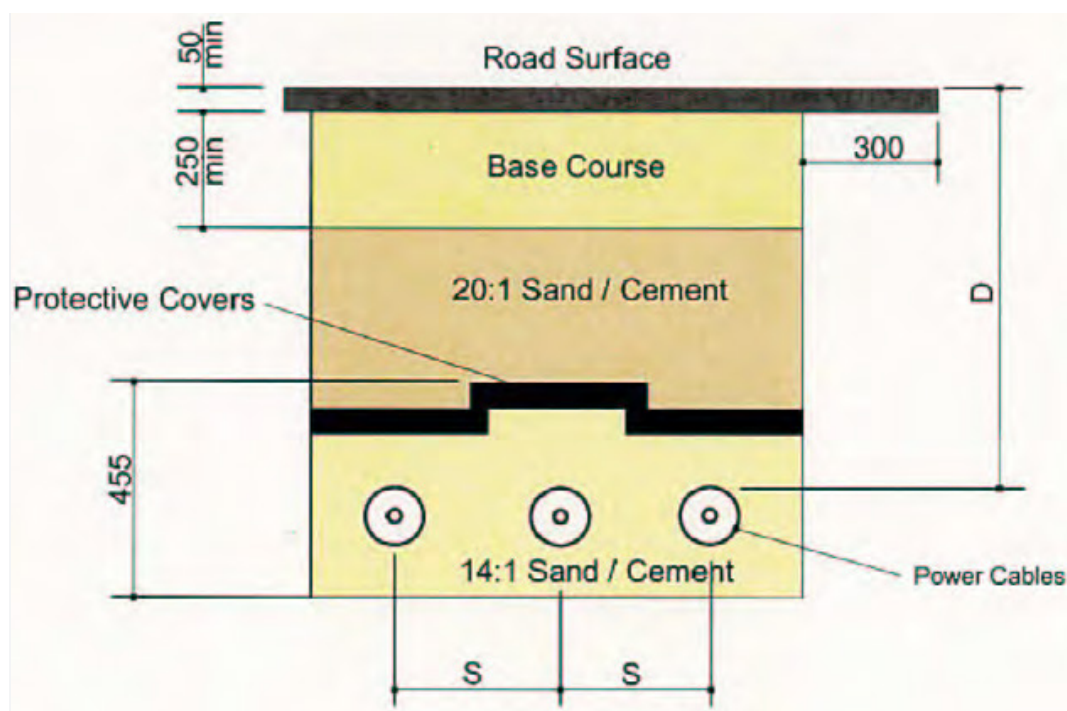


## 10. Attachments

### Attachment 1: Clearances to Other Utility Services



### Attachment 2: Typical Configuration – Direct Buried Cables





Find out more at:  
Telephone: 1800 222 537  
[www.Transgrid.com.au](http://www.Transgrid.com.au)