

# BS 2823 Trenching and Excavation Procedure

## Safety and Wellbeing

September 2023

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## 1. Purpose

The purpose of this procedure is to set out South East Water’s minimum requirements for trenching and excavation works.

South East Water’s specific requirements **in addition** to WorkSafe Victoria Compliance Codes and guidance are contained within blue highlighted text boxes throughout this document.

Trenching and excavation is generally designated as **high risk construction work** in the *OHS Regulations* and is one of South East Water’s Living Safely Rules (LSR’s) which target the highest risks to health and safety associated with South East Water’s operations.

## 2. Scope

This procedure applies as a minimum requirement for all employees, contractors and other persons who perform **any** trenching and excavation works on South East Water sites - **regardless of the depth.**

## 3. Definitions

Angle of repose	The slope at which dumped or excavated soil is naturally stable and does not fall away.
Before You Dig Australia (BYDA)	A national organisation that provides underground asset information as a free service. Previously known as Dial Before You Dig (DBYD) and before that (in Victoria) the Melbourne One Call (MOC) service.
Emergency work	Work that is required to be immediately undertaken to rectify an unexpected breakdown of an essential service (including gas, water, sewerage, electricity and telecommunications) to enable continuance of that service.
High risk construction work	In relation to trenching and excavation activities: involving a trench or shaft if the excavated depth is more than 1.5 metres or involving a tunnel.
Shaft	A vertical or inclined way or opening from the surface downwards or from any underground working and the dimensions of which (excluding the perimeter) are less than its depth.
Trench	A horizontal or inclined way or opening commencing at and extending below the surface of the ground and open to the surface along its length, the length of which is greater than its width and greater than or equal to its depth, and is used or to be used for the laying, removal or repair of a pipe or cable.
Tunnel	An underground passage or opening in an approximate horizontal plane and which begins at the surface or from an excavation of any sort.
Unprotected edge	The edge of a surface from which there is a horizontal gap, void or space of more than 300 millimetres and which is not provided with a barrier to prevent a fall.

## 4. Planning excavation work

### 4.1. Notice of construction excavation work

WorkSafe Victoria must be notified in writing at least three days before commencing *construction excavation* work on a shaft, trench or tunnel that will be of sufficient dimensions or depth to allow the entry of a person, or if there will be a risk to the health or safety of any person from the excavation.

The following definition of a *construction excavation* applies for 'notice of construction excavation work' purposes to WorkSafe Victoria:

- a) a trench if the excavated depth is more than 1.5 metres;
- b) a shaft if the excavated depth is more than 2 metres;
- c) a tunnel.

The requirement to notify does not apply to excavation of a shaft, trench or tunnel being made for the purpose of undertaking *emergency work*.

### 4.2. Emergency works

The urgent nature of emergency works does not provide an exemption from other obligations under the *OHS Act* or *OHS Regulations*.

Emergency works situations still require ground collapse risk controls to be determined by a competent person. Also refer to the 'Reducing the risk of ground collapse' section of this procedure.

Suitable equipment and resources for tasks associated with the emergency works - for example, trench shields and traffic management - should be determined and made readily available.

### 4.3. Adjacent buildings or structures

Any excavation that is below the level of the footing of any structure (including retaining walls) that could affect the stability of the structure shall be assessed by a suitably qualified person (for example, a geotechnical engineer). The excavation should be secured by a suitable ground support system designed by a suitably qualified person (for example, a structural or geotechnical engineer).

## 5. Undertaking excavation work near services

### 5.1. Preliminary identifying, locating and prospecting

All reasonably practicable steps shall be taken to avoid inadvertent contact with underground and overhead services. For use of powered mobile plant near overhead services, also refer to the South East Water document *BS 1022 Safe Use of Powered Mobile Plant Procedure*.

A 'Before You Dig Australia (BYDA)' inquiry must be conducted and reviewed before excavation works commence.

For excavation works within the property boundary of fixed South East Water sites - such as Water Recycling Plants (WRP's) and sewer pump stations - all reasonable steps shall be taken to obtain 'as-built' drawings/ site plans to make informed judgements and planning in relation to the intended works.

BYDA and other "as-installed" plans only give an indication of where services should be located; this should not be the only exploration prior to work commencing.

Paint colours used to indicate identified underground services should be consistent with recognised standards, i.e. AS 5488.1 and AS 1345.

Utility	Colour
Communications	White (or black when on white background)
Drainage	Green
Electricity	Orange
Fire Service	Red
Gas	Yellow
Water	Blue
Recycled Water	Purple

Table 1: Standard paint colours used to mark service assets



Figure 1: Paints used to mark underground services on a South East Water project

## 5.2. Quality levels for locating of underground services

Underground services shall be located to a ‘Quality Level’ appropriate to the level of risk. For further guidance on quality levels for the management of subsurface utilities, refer to AS 5488.

Note that quality levels may vary on separate sections of an underground service, depending on the source information available for each section.

Quality Level	Potential uses and limitations	Sources of information
D	<p>Used to establish the <b>potential presence</b> of subsurface utilities.</p> <p>Does not encompass any field verification involving direct measurement. A <b>broad indication</b> of the location and type of utility.</p>	<ul style="list-style-type: none"> <li>• A “<b>Before You Dig Australia</b>” (BYDA) inquiry</li> <li>• As-built plans</li> <li>• GIS database</li> <li>• Anecdotal evidence</li> <li>• Cursory site inspection</li> </ul>
C	<p>Surface feature or visible utility assets used to <b>indicate the existence</b> of an undefined entity.</p> <p><b>Does not indicate the location</b> of the subsurface utility with respect to the surface feature, <b>nor its depth</b>.</p>	<ul style="list-style-type: none"> <li>• Visible information obtained from surface features</li> <li>• Other sources as listed above for Quality Level D</li> <li>• <b>Ground Penetrating Radar (GPR)</b>, acoustic or photographic</li> </ul>
B	<p>Used to <b>indicate the existence and location</b> of subsurface utilities in <b>three dimensions</b>.</p> <p>Electronic detection is <b>only an indication of the existence</b> of subsurface utilities and <b>should not be used for obtaining accurate depth information</b> due to the potential for interference from other adjacent services or due to geological conditions.</p>	<ul style="list-style-type: none"> <li>• Survey measurement that does not satisfy Quality Level A spatial tolerances</li> <li>• <b>Trace</b> (applying an electromagnetic signal along or within the utility to a known point/ visible point)</li> </ul>
A	<p>Used to indicate a utility’s <b>precise position in three dimensions</b>.</p> <p><b>May not identify the internal structure or content</b> of the asset. <b>May not be achievable in all field situations</b> due to geological conditions or construction methods such as concrete encasing.</p>	<ul style="list-style-type: none"> <li>• Physical sighting to obtain the position of the utility at nominated intervals</li> <li>• <b>Potholing</b> to obtain the position of the utility at exposed locations</li> </ul>

Table 2: Quality Levels for locating of underground services

### 5.3. Non-destructive digging (NDD) and 'potholing'

To avoid damage/ destruction of underground services or their protective coatings, non-destructive digging (NDD) techniques - i.e. hand digging or sensitive vacuum/ water blasting - shall be used where required.

All gas and electrical services as well as any services in a multiple configuration, i.e. in a cluster, shall be physically exposed (proved) by NDD at nominated intervals where practicable before starting mechanical excavation.

Where hydro or air excavation is used, maximum operating pressure should be identified and adhered to.

'Potholing' is an excavation technique used to locally expose underground services at a point.



Figure 2: Two images showing the potholing technique

## 5.4. Underground No Go Zone clearances

Underground No Go Zone rules can be divided into two distinct types, depending on the service:

- services greater than 66kV and all pipelines licensed under the *Pipelines Act*
- services LESS than or equal to 66kV or services NOT licensed under the *Pipelines Act*

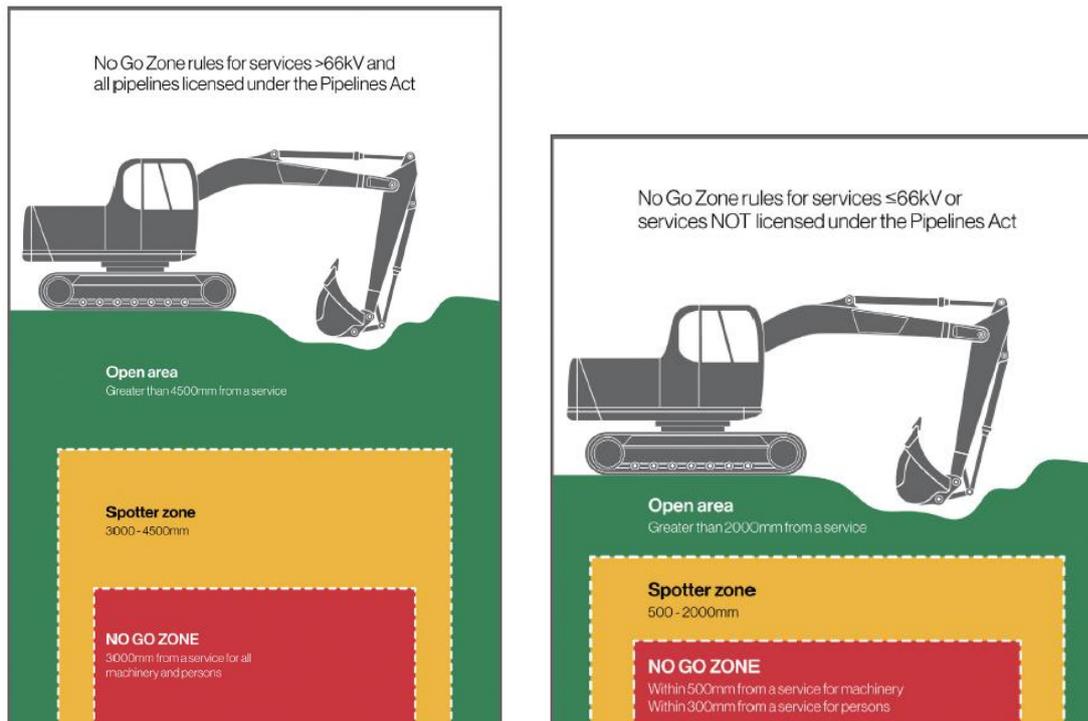


Figure 3 Underground No Go Zone rules

Under Energy Safety legislation, permission must be sought from service owners prior to excavation above electrical and gas services.

For electrical services:

- **No Go Zone:** Works within this area requires a No Go Zone site assessment and a Permit to Work/ permission and compliance with the permit conditions.
- **Spotter Zone:** Works within this area requires a No Go Zone site assessment and possible Permit to Work.

If a spotter is required, they shall:

1. spot for one item of mobile plant at a time
2. spot for the mobile plant that they are registered for (endorsement on spotters' card)
3. be dedicated to the spotting task at all times when an operator is at the controls of the mobile plant
4. be able to provide immediate and direct notice/ warning to an operator

A spotter should be clearly identifiable to the operator and to others on site, for example by wearing a specifically coloured safety vest or hard hat and/ or a spotter arm band.

For spotter requirements also refer to the 'Training and competency' section of this procedure.

## 5.5. Excavation near overhead line structures

For excavation works near overhead line structures, i.e. power poles and towers, the following exclusion zones apply:

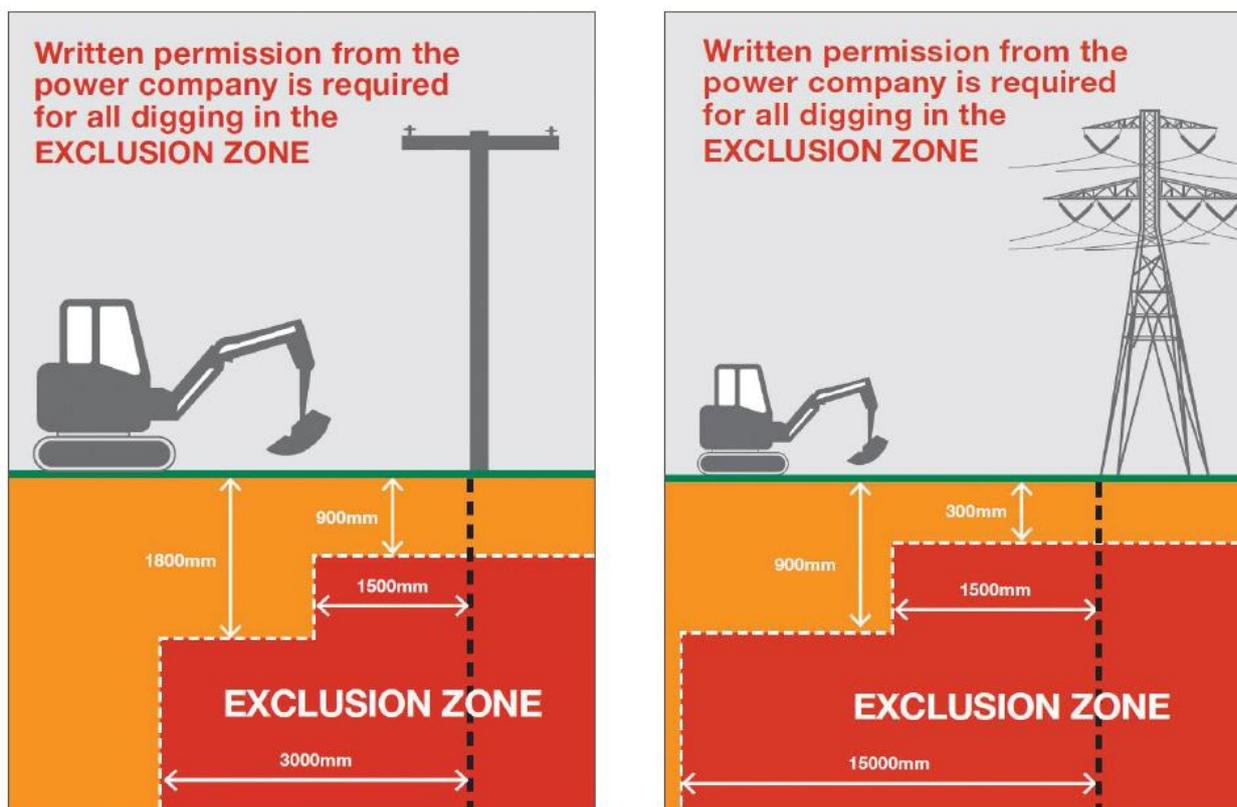


Figure 4: Overhead line exclusion zones

## 6. Administrative controls

### 6.1. Safe Work Method Statement (SWMS)

If any **high risk construction work** is being conducted as part of the works, a compliant Safe Work Method Statement (SWMS) must be developed for the work and reviewed, agreed and understood by the work party prior to the works commencing.

Where a SWMS is not mandatory, a safe system of work needs to be developed and implemented to manage the associated risks and controls.

### 6.2. Emergency procedures (rescue plan)

Documented emergency procedures shall be prepared in consultation with the work party prior to performing any excavation work if there is a risk of a person becoming engulfed by soil or other material when the work is performed.

For practical purposes, this requirement applies to **any** excavation of sufficient dimensions or depth to allow the entry of a person.

Regular practice runs of all relevant emergency procedures shall be held and records maintained to sufficiently demonstrate current knowledge.

## 7. Controlling risks in excavation work

### 7.1. Placing excavated material

If excavating in sloping ground, excavated material shall be placed on the down-slope side of the excavation.

To ensure safe access along all sides of an excavation, the toe of the excavated material needs to be at least 500 mm from the edge of the excavation.

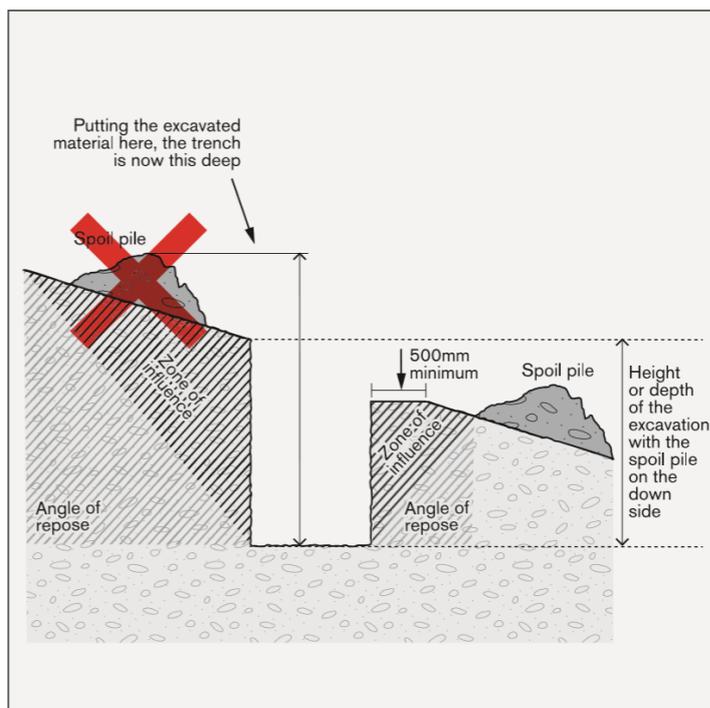


Figure 5: Placement of excavated material

Toe boards reduce the risk of excavated material sliding into the excavation and provide falling object protection. Retaining toe boards or trench shields need to protrude at least 300 mm above the toe of the spoil pile.

### 7.2. Prevention of falls

Excavations may present a fall hazard by persons being in close proximity to an *unprotected edge* or to a hole, trench, shaft or pit that is of sufficient dimensions to allow a person to fall into the hole, trench, shaft or pit. To control the associated risks, the hierarchy for prevention of falls shall be implemented so far as is reasonably practicable.

Specific risk controls for falls into an excavation include:

- trench shields and/ or suitably rated guard rails which extend at least 900 mm above ground;
- using perimeter fencing, barricades, signage and warning barriers such as 'Fortress' type barriers, star pickets and parawebbing;
- establishing a safe entry point where workers should enter a trench or excavation, that protects them from falling into the trench or excavation;
- backfilling the trench or excavation as work progresses;
- backfilling voids between a trench shield and trench wall.

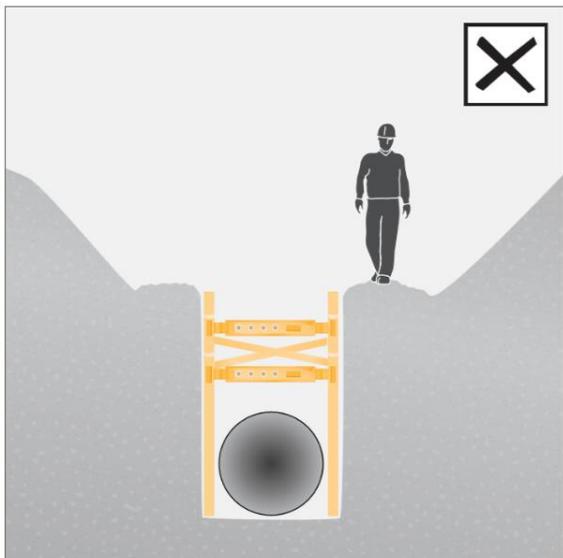


Figure 6: Trench without edge protection

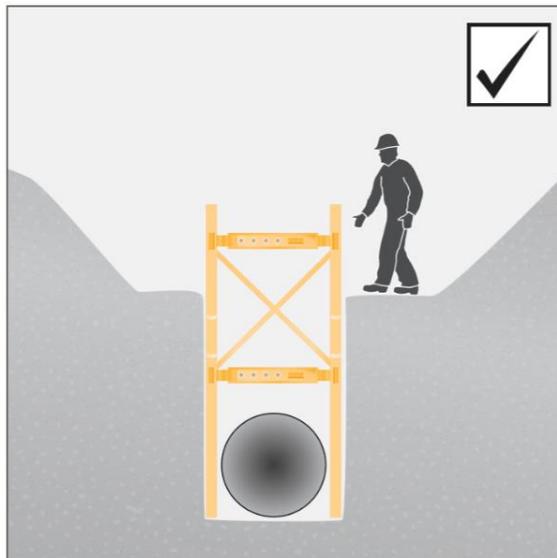


Figure 7: Trench with edge protection

Safe access and egress (entry and exit) to and from excavations shall be provided. Where portable ladders are used, they shall be industrial grade, fit for purpose and set up in a correct manner with at least 1 metre overhang and securely fastened at the top.

Davit arms and safety harnesses are recommended in conjunction with portable ladders as a secondary fall prevention measure for deep excavations.

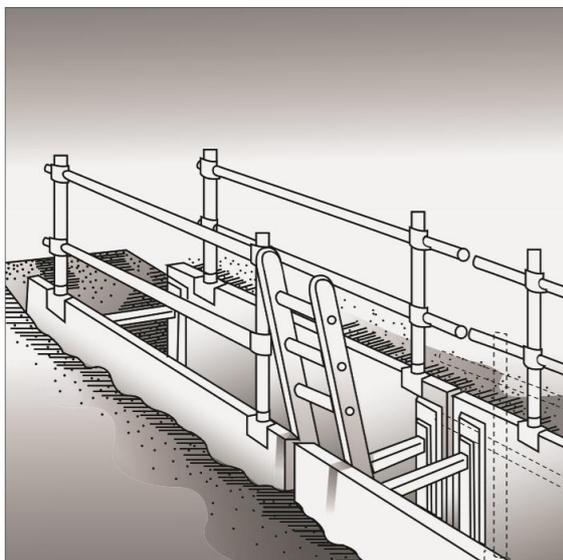


Figure 8: Trench shields with guard rails and ladder

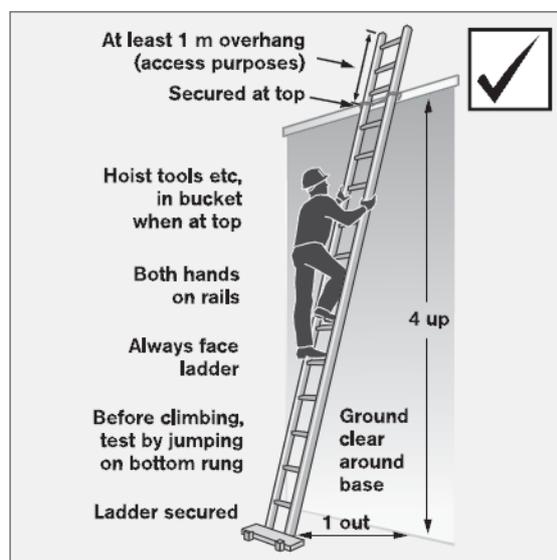


Figure 9: Acceptable ladder use

For further information on prevention of falls, refer to the South East Water document *BS 1603 Falls Prevention Procedure*.

### 7.3. Site security and aftercare

Suitable controls shall be implemented to ensure the public are not put at risk from exposure to site hazards. Specific risk controls for falls into an excavation are set out in the prevention of falls section above.

Consideration should also be given to the following key risk factors:

- site location (e.g. near houses, shops, playgrounds or schools)
- paths or other public access routes passing the site
- the type of work being done
- the mobile plant being used
- materials stored on the site.

Temporary construction fence panels (1.8 to 2 metres high) provide adequate security for most situations. Concrete filled bases and bolted fence clips (rather than tie-wire or cable ties) should be used to secure this type of fencing.

'Fortress' type barriers or parawebbing firmly attached to capped star pickets or posts may be suitable to secure low risk hazards.

'Danger - Deep Excavation' signs shall be placed in prominent locations as appropriate.

Danger tape, flags (bunting) and signs provide a visual warning only so are not adequate as site security.

Danger tape or flags shall not be used as a traffic management barrier, i.e. involving vehicles or cyclists.

Excavations should be inspected prior to re-entry at the start of each shift if left unattended.

### 7.4. Road plates and covers

Road plates should be used to temporarily cover an excavation, for example while ongoing excavation work is being conducted on a roadway.

Road plates shall have sufficient strength to sustain traffic loads without adverse deflection and have a slip-resistant surface.<sup>A</sup>

Road plates shall have designated lifting points and be legibly marked with their total weight.

Road plates may need to be sufficiently secured, for example with the use of steel pins, and the edges of the plate may need to be ramped with the surrounding surface, such as with the use of asphalt.

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<sup>A</sup> Guidance on load resistance and slip-resistance of trafficable covers is provided in AS 3996

Examples of compliant road plates over open excavations are provided below:



Figure 10: Compliant road plates over open excavations on South East Water projects

Plastic or wooden covers may be appropriate to cover open excavations that are not on a roadway.

Where plastic or wooden covers are used, controls to prevent unauthorised access to the excavation must be maintained.

An example of compliant plastic cover over an open excavation is provided below:



Figure 11: Compliant plastic cover over an open excavation on a South East Water project

### 7.5. Atmospheric conditions

Some excavations will meet the criteria for classification as a confined space, for example if the excavation has a limited or restricted means of entry or exit and it is likely to contain an atmosphere that has a harmful level of any contaminant.

For further details of confined spaces and Confined Space Entry (CSE) refer to the South East Water document *BS 1955 Confined Space Entry Procedure*.

When using pipe joining glues/ solvents in an excavation, a P1 or P2 disposable respirator with charcoal filter conforming to AS/ NZS 1716 shall be used as a minimum.

## 8. Reducing the risk of ground collapse

Where a person enters a trench and there is a risk of ground collapse, the trench shall be positively supported, or be benched, battered or shielded **regardless of the depth** of the trench.

A competent person shall determine the necessary control measures to prevent the risk of ground collapse; based on the nature of the excavation work and ground conditions.

The three main types of ground collapse risk controls are:

- trench shields
- benching and/ or battering
- positive ground support (for example, shoring).

### 8.1. Trench shields

Trench shields shall incorporate certified lifting points for installation and removal. The design of trench shields shall be carried out by a suitably qualified person.

Rated lifting equipment shall be used at all times while trench shields are being lifted or suspended. The installation and removal of trench shields shall be undertaken by an appropriately qualified plant operator and, where appropriate, a licensed dogger or rigger.

Prior to undertaking assembly or dismantling activities involving trench shields, a safe system of work needs to be developed in accordance with the manufacturer's instructions.

Trench shields shall be legibly marked with their total weight.

Prior to use on site, trench shields should be visually inspected for signs of wear or damage. Full inspections should be conducted on an annual basis at a minimum by a competent person. Results of inspections and maintenance conducted should be recorded.

Trench shields shall be installed and removed in a manner that does not cause damage to or compromise the integrity of the shields.

Trench shield end plates shall be fitted as required, in accordance with the ground conditions.

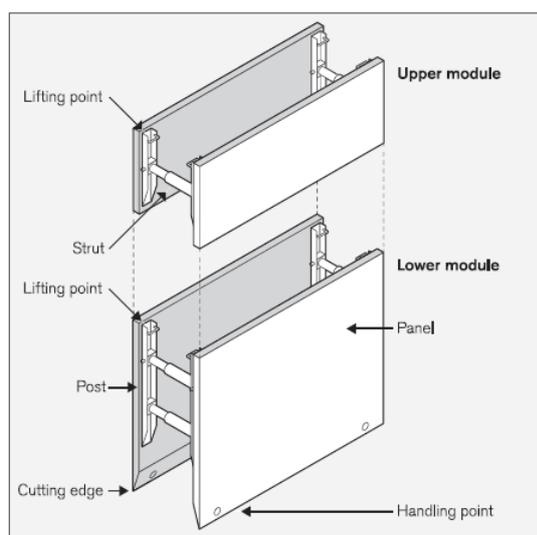


Figure 12: Typical trench shield



Figure 13: Compliant shields on a SEW project

## 8.2. Benching and battering

**Benching** is the creation of a series of steps in the vertical wall of an excavation to reduce the wall height and improve stability. Bench steps shall be no greater than 1 metre vertically and no less than 1 metre horizontally.

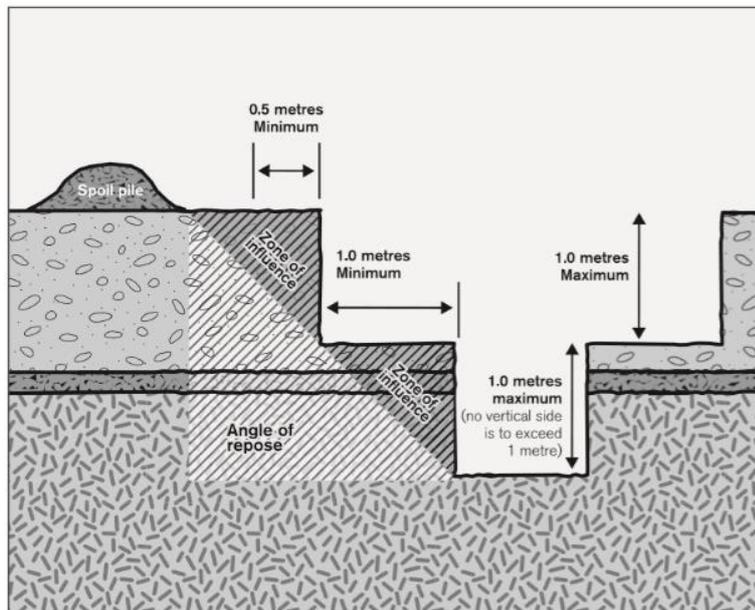


Figure 14: Benching

**Battering** is where the wall of an excavation is sloped back to a predetermined angle to improve stability.

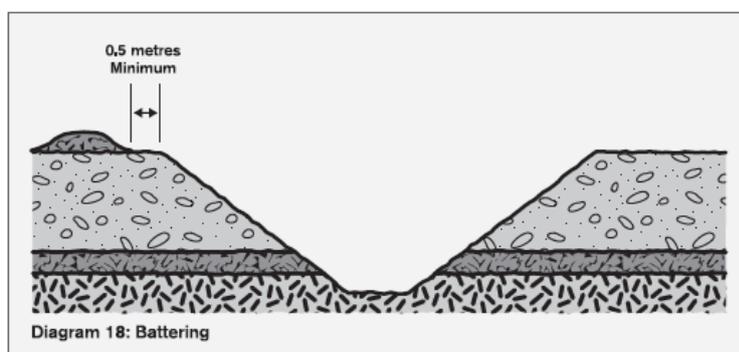


Figure 15: Battering

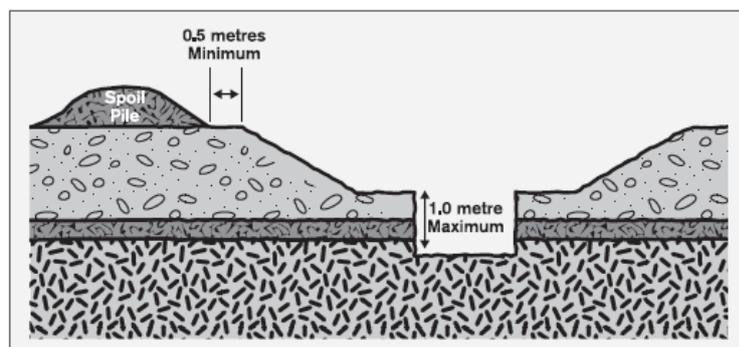


Figure 16: Combination of benching and battering controls

Sides of the excavated face should be battered to the *angle of repose* of the spoil pile. If it is proposed to have a battered angle higher than the angle of repose of the spoil pile, a geotechnical analysis needs to be undertaken and documented before excavation work commences.

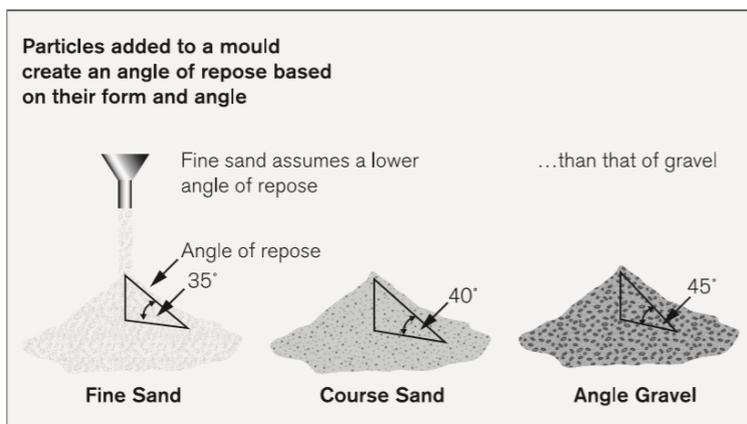


Figure 17: Examples of angles of repose for certain materials

### 8.3. Shoring

Shoring is a positive ground support system that can be used when the ground conditions, location or depth of an excavation makes battering or benching impracticable (for example, unstable ground conditions such as excavating sand, silt or clay). It provides support for excavated faces, preventing movement of the excavation sides that can lead to ground collapse. Shoring needs to be designed by a structural or geotechnical engineer for the specific workplace ground conditions.

Shoring includes closed sheeting (such as steel sheet piling), soldier sets (timber or hydraulic) and ring shaft ('ring and timber') sets.

## 9. Training and competency

For trenching and excavation works, at least one person in the work crew shall be on site while works are being conducted who has completed the national competency unit listed below, followed by **3-yearly refresher** training.

- **Install trench support**

If a spotter is required, the spotter must have completed training endorsed by Energy Safe Victoria (ESV) and be registered with ESV.

A person with a **Dogman** or **Rigger** class on their Spotter's registration card may act as a Spotter for any type of plant (without holding a ticket or demonstrating competence and experience for that item of plant).

## 10. References

### 10.1. Legislation

- Occupational Health and Safety Act 2004 (Victoria)
- Pipelines Act 2005 (Victoria)
- Occupational Health and Safety Regulations 2017 (Victoria)
- WorkSafe Victoria Compliance Code - Excavation – Edition 2, December 2019
- WorkSafe Victoria Compliance Code - Prevention of Falls in General Construction - Edition 2, December 2019

### 10.2. Guidance Material

- WorkSafe Victoria and Energy Safe Victoria (ESV) - Guidebook - Undertaking work near underground services - December 2022
- WorkSafe Victoria - Industry Standard for Civil Construction – June 2017
- WorkSafe Victoria Information Sheet - Trench shields and road plates - September 2014
- Energy Safe Victoria – Information online: [Spotter's registration | Energy Safe Victoria \(esv.vic.gov.au\)](#)<sup>B</sup>

### 10.3. Standards

- AS 1345 - 1995 (R2018) Identification of the contents of pipes, conduits and ducts
- AS 1657 - 2018 Fixed platforms, walkways, stairways and ladders - Design, construction and installation
- AS/ NZS 1716 - 2012 Respiratory protective devices
- AS 3996 - 2019 Access covers and grates
- AS 5488.1 - 2022 Classification of Subsurface Utility Information (SUI) - Subsurface Utility Information

### 10.4. South East Water documentation

- BS 1022 Safe Use Of Powered Mobile Plant Procedure
- BS 1603 Falls Prevention Procedure
- BS 1955 Confined Space Entry Procedure

## 11. Revision status

### 11.1. Revision table

Date	Description	By	Approval by
11/07/2020	New document	D Sweeney	P Grimson
19/09/2023	Major revision in line with updated references.	D Sweeney	D Anderson

### 11.2. Review intervals

This document shall be reviewed and revised as necessary at no greater than **five** yearly intervals.

<sup>B</sup> Accessed online, 06/10/2023