Southern Ports

Excavation and Penetration Procedure

DOCUMENT CONTROL

Revision Number	Description	Reviewed by	Approved by	Review Date	Issue Date
1	New document.	Tony Leeson Adam Dardha Brant Grundy	Tony Leeson	16/02/2015	16/02/2015
2	Review	Tony Leeson	Tony Leeson	11/09/2017	11/09/2017
3	Review	Alex Leonard	Alex Leonard	30/10/2017	30/10/2017
4	Review	Health and Safety Representatives Supervisors	Electrical Supervisor	01/10/2020	01/10/2020
5	Review	Environmental Advisor	Electrical Superintendent	08/11/2021	08/11/2021
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7	Review	Operations and Maintenance Manager	Regional Manager – Esperance	28/06/2022	28/06/2022
8	Review and update for all ports.	Squad review: Port Health Safety & Environment teams, Sustainability Coordinator	Chief Operating Officer	23/06/2023	23/06/2023
9	Review and update.	Squad review.	Chief Operating Officer	24/09/2025	26/09/2025

AUDIT

This Procedure shall be reviewed or revised:

- where a Risk Assessment or Audit identifies a need to review
- when legislative changes impact this Procedure
- following a significant incident involving this Procedure
- at least every three years.

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1 INTRODUCTION

1.1 Purpose

This Excavation and Penetration Procedure provides a systematic process to manage for all Southern Ports workplaces and work activities for work involving the disturbance of ground (excavation work) or conducting a penetration at Southern Ports.

1.2 Scope

In Scope	Out of Scope
All activities relating to Excavation and Penetration Procedure by Southern Ports workers (including employees, contractors and port users – but not visitors) on landside restricted zones, marine restricted zones or land vested in Southern Ports and in Southern Ports marine waters.	Excavation and Penetration Procedure activities on land and marine waters not under the control of Southern Ports.

1.3 Roles and Responsibilities

Roles and responsibilities for this Excavation and Penetration Procedure are shown in Table 1 below.

Table 1: Roles and Responsibilities

Role	Responsibility
Permit Requestor	The *Permit Requestor* shall: Be currently competent in the SPA training module for Permit Requestor and be trained and competent in the activity applicable to this permit. complete Sections 1 to 4 of an Application for an *Excavation or Penetration Permit*. Ensure all hazards associated with the proposed task have been identified, assessed and controlled. include documentation indicating the proposed excavation or penetration area and the Scope of Work, including proposed depth, width and length; start date; and scheduled completion date. submit the Application to the *Permit Approver* – nominally five working days prior to proposed commencement of the works.
Permit Approver	A *Excavation Permit* or *Penetration Permit* shall be approved by the *Permit Approver* prior to excavation or penetration work being undertaken. The *Permit Approver* shall: Be currently competent in the SPA training module for Permit Requestor and Approver and be trained and competent in the activity applicable to this permit. • review the proposed excavation or penetration Scope of Work; • review, identify and mark out location of existing services in the excavation / penetration area; ensure the Southern Ports HSE Department and the Asbestos Register have been consulted regarding possible Asbestos containing material and suspected contaminated ground being located in the excavation area; • complete Section 5 of the *Application for Permit* and issue the permit to the *Permit Requestor*; • ensure the *Permit Requestor* understands and acknowledges the conditions of the *Permit*.
Electrical Supervisor or their delegate	The *Electrical Supervisor* or their delegate shall:

Table 1: Roles and Responsibilities

Role	Responsibility
	• Ensure underground and concealed services are identified, and that controls are implemented to mitigate contact with them. • If the electrical supervisor is a third party, they must consult with a Southern Ports Subject Matter Expert, to obtain site specific information prior to permit being authorising
Permit Requestor	The person that the permit is issued to, whom is the supervisor of the work group undertaking the excavation or penetration works. The *Permit Requestor* shall: Be currently competent in the SP training module for Permit Requestor and Approver and be trained and competent in the activity applicable to this permit. Ensuring the conditions of the Permit and the authorised excavation or penetration methodology are adhered to. • Provide all 'As Constructed' survey data for existing and new services to the Southern Ports *Permit Requestor* and *Project Manager*, in accordance with Section 13 Survey Data. • Manage the specific requirements associated with excavation work including but not limited to compliance with the authorised methodologies associated with the scope of work, and where an excavation is being conducted that the installation and maintenance of safe access and ground support systems are compliant.

2 CRITICAL CONTROLS

- Excavation and / or Penetration Permit in place
- Where there is a potential for engulfment in an excavation, ensure a rescue or contingency plan with appropriate equipment is readily available.
- risk assessment by competent person prior to commencing work.
- Competent workers/Operators to perform task and operate equipment
- A process to ensure hard barricading of open trenches, holes in flooring, walkways/access and rooftops. Restricted access, signage and demarcation, barricading or earth bund ½ height of the largest mobile plant working in the area
- The ground support system for excavations has been inspected and authorised by a competent person prior to entry.
- Positive communication around operating equipment
- Safe means of access/egress appropriate to the scale of the excavation,
- A process to identify in wall/ underground services that includes use of wanding, obtaining services survey drawings, dial before you dig information prior to work and update post completion.
- Benching and shoring in has been designed for the excavation conditions and is engineer approved.
- Combustion plant or the use of chemicals do not compromise the atmosphere within the excavation
- Pre-operational/work area inspections of open trenches to identify potential failure of protections.

3 GENERAL REQUIREMENTS

A Permit authorised by an Appointed *Permit Approver* shall be obtained by the *Permit Requestor* (the person who is supervising the works) prior to any excavation or penetration work being undertaken.

In addition, during complex civil engineering work, where an excavation has the potential to impact on existing assets such as structures or existing services, the Southern Ports *Project Manager / Works Supervisor* shall ensure a Temporary Works Plan is developed and authorised by a Civil Engineer to mitigate engineering changes to the existing structures or services or the project Safety in Design.

The Job Hazard Analysis shall then be then reviewed to reflect the changed methodologies.

4 RISK MANAGEMENT

Safety in and around excavations should be considered as part of job planning from the commencement of an excavation works. Identification of hazards should be part of the planning, design and estimating process

All simultaneous activity in the area and other potential hazards should be identified by the key stakeholders involved in the excavation works before the Permit Request is made or excavation commences, and reviewed during the life of the works as site conditions change.

Hazard identification and assessment of risk from those hazards should be an ongoing process in consultation with health and safety representatives where possible, workers involved in the task throughout each individual excavation or penetration.

Identifying hazards at an early stage should enable excavation methodologies and protective systems to be chosen which will reduce risk, as far as practicable, and remain fit for purpose throughout all stages of the works.

Depending on the complexity of an excavation or penetration a combination of Safety in Design, SWMS, risk assessment and ground conditions engineering assessment, Job Hazard Analysis and relevant Permit shall be used to identify the hazards, assess the risk and identify the required protection controls. This information should be provided to the Permit Approver for consideration and coordination of activities, before approval of the Permit is made.

5 PENETRATION

For the purpose of this procedure, a penetration is defined as work which will compromise a man-made structure that may contain concealed services.

A penetration may be by manual or mechanical means including but not limited to coring or cutting, drilling or the insertion of a fastener.

A penetration of a structure such as but not limited to walls, floors, ceiling, re-enforced concrete walls or berth surfaces that may result in injury or harm to workers as a result of contact with concealed services such as potable water, fire water, sewage, hydraulic, compressed air or electrical services. In addition, a penetration may potentially compromise the structural integrity of critical infrastructure including but not limited to a load bearing surfaces, berth structure, vessels' hull, or a gantry crane boom.

The *Permit Requestor*shall complete Sections 1 to 4 of an Application for a Penetration Permit.

The request shall include documentation indicating the proposed location, depth and physical dimensions of the penetration, available services systematic diagrams, and the proposed scope of work.

The application should be submitted to the *Electrical Supervisor*, nominally 5 working days prior to proposed commencement of the works. Where the 5 day period of notice has not been provided, approvals may be delayed.

The *Electrical Supervisor* or their delegate shall conduct an inspection of the proposed work area and consult the available systematic diagrams and the scope of work to determine the potential of hidden services.

If no services are identified, or the potential for contact is determined to be low risk, the *Electrical Supervisor* or their delegate shall sign Section 5 of the Penetration Permit, and if required, identify conditions to mitigate potential contact.

If the *Electrical Supervisor* or their delegate are unable to confirm the location of concealed services and considered it unsafe to penetrate the structure, the permit shall not be authorised.

The *Permit Requestor* shall cancel the proposed works or identify an alternate:

- non-penetration method to fasten an object to the structure;
- location for the object; or
- route for the proposed services.

The *Permit Requestor* shall review the Job Hazard Analysis to reflect the alternate scope or work methodologies and develop a new penetration Permit application as applicable to the revised scope of work.

6 EXCAVATION

For complex excavations at Southern Ports, a competent person shall be appointed with an appropriate engineering competency, to manage the increased risk of complex excavations.

Complex excavation examples:

- deeper than 1.2 metres;
- adjacent to a body of water;
- in soils with slip planes or variable ground conditions (soft sand);
- involving complex de-watering;
- where it is necessary to evaluate the pressure on excavation walls from surcharge loads such as excavated material, machinery, or adjacent structures so as to determine appropriate ground support systems.

All competent persons should have a sound knowledge of:

- how to identify and locate underground services;
- the hazard identification, Safety in Design and risk management process for excavation work;
- safe work practices for excavation work including ground support systems;
- how to identify soil types and other factors that affect the safety and stability of an excavation; and
- Southern Ports procedures, workplace health and safety legislation, relevant Australian Standards and Codes of Practice.

A worker shall not enter an excavation with a depth of 1.2 m or more that has not been protected by a support structure such as shoring, or an appropriate ground support system (Reference 2.8/2.9).

6.1 Location Of Underground Services And Other Structures

Before any excavation work commences, the exact location of all underground services and structures needs to be established in accordance with the current legislation.

These services and structures include electrical power cables, telecommunications and data cables, fuel lines, sewer pipes, water and drainage pipes, soak wells, storage tanks, gas mains and structural footings.

The *Permit Requestor* , in consultation with the *Excavation Supervisor*, shall mark out the general area that requires existing services to be located, using a suitable marking paint for the environment where it is to be used.

During the location process, all identified services shall be marked out with marking paint of a different colour to clearly represent each different service. Refer to Attachment A.

Systems such as but not limited to Arc Geographic Information System mapping, Before you Dig, Ground Penetrating Radar or electronic cable locator device may be used to determine the exact location of underground services. However, a visual method such as Hydro vacuuming (pot holing) is needed to confirm the location before work can commence.

When determining the location of underground services, the Four P's principle should be applied:

- Pothole: every 5 metres to ensure that the existing services location is known and understood before commencing;
- Plan: develop a risk based authorised excavation methodology and traffic control plan;

- Protect: install ground support systems and barricading to protect the excavation site and existing services; and
- Proceed: develop a Job Hazard Analysis to assess the prevailing work environment conditions and apply for the applicable permits including but not limited High Voltage Access, Hot Work and Confined Space permits.

After authorisation of an Excavation Permit and where services are identified, a mechanical excavation using a tooth bucket may be undertaken to a maximum depth of 150 mm to penetrate a road surface base.

Excavations greater than 150 mm shall be undertaken by mechanical excavation using a batter bucket (toothless) to within 300 mm of the known pothole depth of the services.

The excavation shall then be continued by manual means (shovel) until the service or structure is located.

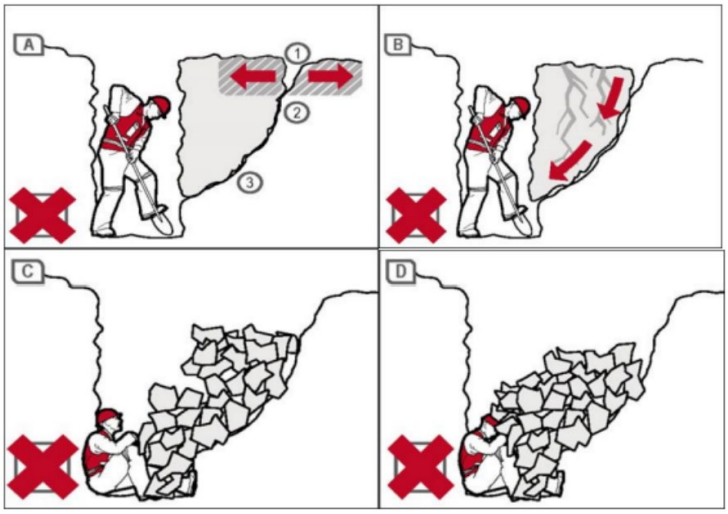
6.2 Cohesive strength and earth pressure

In their natural condition, soils have varying degrees of cohesive strength and frictional resistance. Examples of materials with virtually no cohesive strength are dry sand, saturated sand and gravels with minimum clay content.

Ground encountered in trench excavations can be categorised as:

- hard, compact soil;
- soil liable to crack or crumble;
- loose or highly unstable material.

Figure 1: Trench Collapse and Associated Ground Forces
(source: Excavation Code of Practice)



Non-cohesive faces may be very treacherous. With just the right amount of moisture, they look, for a short time, safe and solid. Very little loss of water by evaporation will make the soil crumble, as would an increase in the water content from rain or other causes.

Evaluating pressure on a trench wall is a complex matter requiring consideration of a number of factors including soil type, moisture content, effect of the weight of the excavated material and adjacent machinery loadings and should be undertaken only by a competent person.

A ground support system shall be in place where a worker is working in a trench greater than 1.2 metres in depth, or where the worker is required to bend over to accomplish a

task in a trench, thus placing an individual's breathing zone in a vulnerable position should the trench wall collapse.

A competent person shall design and authorise the ground support systems prior to entry.

6.3 Support systems and retaining structures

Support systems and retaining structures include shoring systems to support the sides of an excavation, shield systems to protect against cave-in.

This includes Structures such as underpinning, shoring or bracing to provide support to an adjacent structure or an underground installation.

6.3.1 Shoring

Shoring is the provision of support for excavation faces to prevent movement of soil. Shoring or shielding is used when the location of an excavation or the depth of cut makes battering or benching impracticable.

6.3.2 Shields and Trench Box

Shields or trench boxes differ from shoring in that they do not support the trench face. They are intended primarily to protect workers from cave-ins.

The space between the trench box and the sides of the excavation are backfilled to prevent lateral movement of the box.

Trench shields are generally used in open areas where cranage is satisfactory. However, they may also be used in combination with sloping and benching.

Steel shoring and trench lining equipment should be designed in accordance with AS 4744.1:2000 teel shoring and trench lining equipment, Part 1: Design.

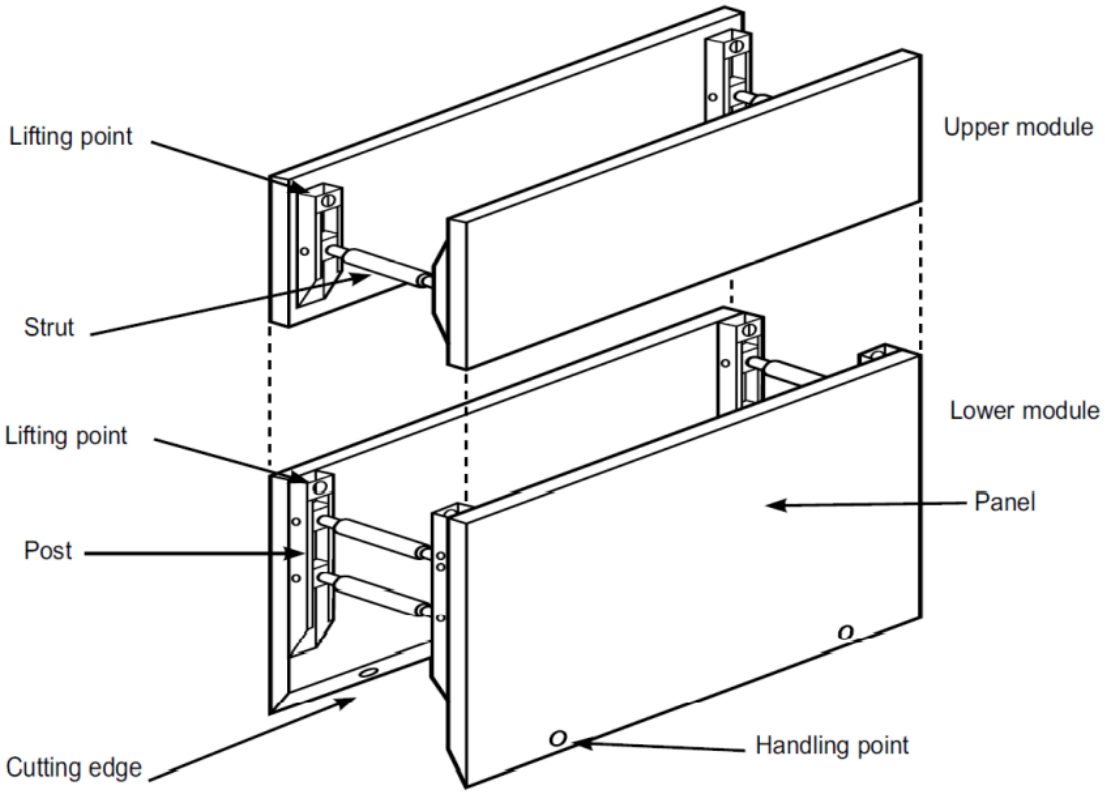


Figure 2: Typical Trench Shield
(source: *Code of Practice – Excavation*)

6.3.3 Battering

Battering, often referred to as sloping, is a way of preventing cave-ins by cutting the face back to a safe incline.

Advice from a competent person is always needed to assess safe slopes since the angle of incline required to prevent collapse varies with the soil type, the height of the face, the moisture content of the soil and any surcharge loads acting on the face.

Battering the sides of an excavation to provide safe working conditions is often only economical for shallow excavations in open ground with minimal obstructions.

For deeper excavations and trenches, shoring or the use of shields can usually provide a quicker and more economical option by reducing the quantity of excavation, placement, and backfill.

These slopes may not be safe in all soil conditions.

Typical circumstances that may require a safer slope (or shoring and other controls) include where:

- there are surcharge loads;
- there are planes of weakness or soil layering;
- the ground to be excavated is not level, groundwater will be encountered, or there are vibrating forces.

Figure 3: Soil Types
(source: Code of Practice – Excavation)

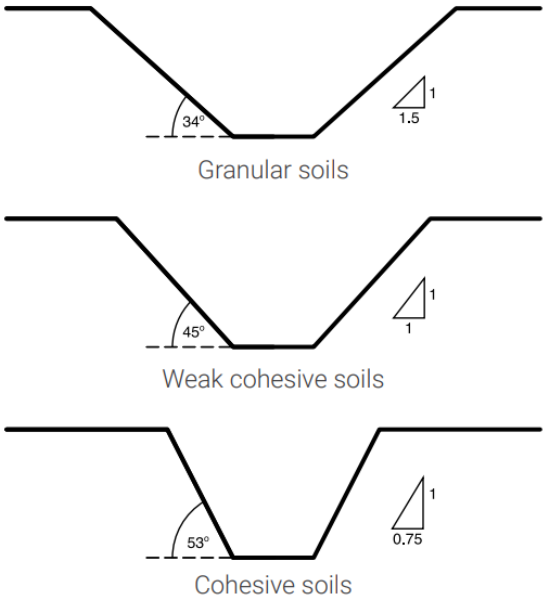


Table 2: Soil properties

Soil type	Distance to Depth ratio	Slope angle
Granular soil: crushed rock, gravel, non-angular poorly graded sand (such as “Bassendean sand”) or loamy sand.	1.5:1	34°
Weak cohesive soil: angular well graded sand (such as “Krakatau sand” or “Spearwood sand,” silt, silty loam or sandy loam.	1:1	45°
Cohesive soil: clay, silty clay or sandy clay.	0.75:1	53°

Employees also need to be protected from excavated or other materials or equipment that could fall or roll into the excavation.

Materials and equipment should be kept at least 1 m from the edge of excavations.

6.3.4 *Benching*

As for battering, the type of soil determines the horizontal to vertical ratio of the benched side.

Benching is suitable only for cohesive type soils.

At Southern Ports, the bottom vertical height of a trench excavation should not exceed 1.2 metres for the bench where the worker is required to bend over to accomplish a task in a trench.

Figure 4: Benching (source: Code of Practice – Excavation)

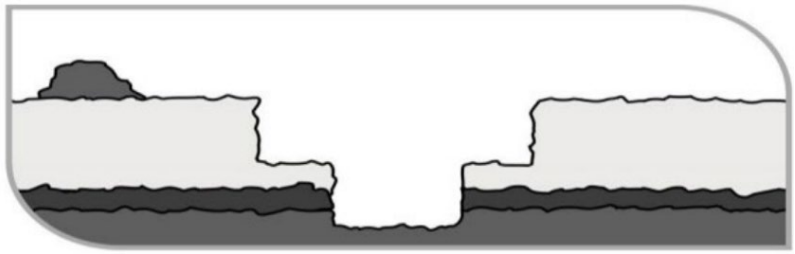


Figure 5: Benching with Battering
(source: Code of Practice – Excavation)

6.4 Barriers and warning signs

Barrier and warning signs should be erected in accordance with the Southern Ports Barricading, Guarding and Signage Procedure.

The location of the barrier from the edge of the excavation will also depend on the nature of the excavation work being carried out.

In deep excavations, the barrier may need to be placed well back from the edge of the excavation to protect the edge from collapse due to the barricade and allow work to be carried out around the edge of the excavation.

Suitable signs that warn of the risk '**Danger – Open Excavation**', are to be erected where excavation work is carried out.

Signs shall be placed at appropriate locations around the perimeter of the excavation where they may be easily seen.

Signs should comply with the requirements of AS 1319:1994(2018) Safety signs for the occupational environment.

Where an excavation impedes on trafficable areas, a Traffic Management Plan shall be implemented.

The location and configuration of traffic management barriers and signage should comply with the Main Roads WA Traffic Management for Works on Roads – Code of Practice.

Where an excavation impacts on the turning circle of surface mobile plant (such as prime movers with semi-trailers; tramming front end loaders; mobile elevated work platforms; and forklifts) the excavation and structural infrastructure should be protected by hard deflection barricading.

Hard deflection barricading shall be concrete barriers, continuous interlinked water filled Jersey Barriers, or a delineated earthen bund greater than 1 metre high.

6.5 Entry and Exit from Excavations

When an employee enters an excavation at least 1.2 metres deep they shall have a spotter present in the immediate work area.

Provision should be made for movement of persons in and around excavations.

For trench excavations, a safe means of egress must be established and should be provided at intervals of not more than 20 metres to limit the travel distance of a worker to 10 metres from the nearest means of exit.

Where portable ladders are used, they must be in accordance with AS/NZS 1892 Portable Ladders – Western Australia, properly secured and extend at least 900 mm above the surface of the excavation or intermediate landing.

6.6 Inspection

Should an excavation be left unattended or open for more than 1 shift, an Inspection of the excavation should be made on return to the excavation by a competent person.

Inspections should look for indications of any situation that could result in cave-ins, indications of failure of protective systems and any indications of hazardous substances or toxic atmospheres being encountered.

Inspections should be carried out:

- daily and before work commences;
- when tension cracks, sloughing, undercutting, water seepage, bulging or other similar events occur or when disturbed soil is encountered;
- when the size, location or placement of the spoil heap changes from the original scope;
- when excavating adjacent to or beneath structures;
- when any indication of movement in an adjacent structure is noticed;
- after every rainstorm or seismic event.

Where inspections reveal potential hazardous situations, workers must be removed from the excavation until precautions have been taken to ensure their safety.

A risk based Total Quality methodology shall be developed and authorized by a competent person in consultation with the Southern Ports *Project Manager* or his delegate prior to re-entry into the excavation.

6.7 Application for an Excavation Permit

When completing an Excavation Permit Application Form the applicant shall ensure that:

- The Form should be submitted to the *Permit Approver* , 5 working days prior to the excavation work being performed.
- In the event of the need for an emergency excavation, the notification period may be waived after consultation with the authorised *Excavation Permit Approver*.
- The Excavation Permit Application shall include the schematic drawings indicating the location of existing underground services and proposed service or structure installations such as:
  - Air
  - Communication
  - Data
  - Drainage

- Electrical,
- Fire Hydrants
- Fuel services
- Sewerage Services
- Water Mains.

Prior to submitting an Excavation Permit Application, and prior to a site inspection by the authorised *Excavation Permit Approver*, the *Excavation Supervisor* shall mark out the limits of the excavation.

The authorised Excavation Permit and Job Hazard Analysis shall be available at the work location at all times during the excavation work.

6.8 Minimising Risk for Concealed Services

All reasonably practical measures to minimise the risk to those carrying out the work shall be implemented. These shall include all or a combination of:

- clearly demarcating boundaries of the work area;
- keeping the demarcated area as small as practicable on the drawings;
- clearly marking the excavation route on the ground, using paint (by the *Excavation Supervisor*);
- identifying and determining the depth of the position of concealed cables, pipelines and services using scanning equipment (by the Electrical Department);
- hydro-vacuuming (Pot Holing) to determine the exact location of underground services;
- marking the location of these services on the ground using paint;
- isolating or protecting the services, including shutting down plant;
- assigning a spotter to constantly watch the excavation for hazards;
- identifying overhead, adjacent and manual handling hazards;
- immediately stopping work in the instance that they Identify chemical, radioactive, asbestos or other hazards;
- ensuring that only a batter bucket is used on the excavation equipment;
- ensuring that at no point in the works that workers in or around the excavation are placed under a suspended load.

The *Excavation Supervisor* shall minimise risk by ensuring:

- Excavations are conducted within the area demarcated on the ground and identified in the *Excavation Permit*. The *Excavation Supervisor* shall inspect the excavation site to ensure the area marked, is where the excavation will take place.
- Informing all employees working on the excavation of the risks and controls at the daily Prestart meeting and by ensuring all employees read and sign onto to the Job Hazard Analysis for the work.
- Hand excavation or pot holing is conducted within one meter of any known service to expose and confirm identification, exact location, direction and depth prior to any mechanical digging.
- The presence of other services which may not be identified on drawings or are masked by existing services including but not limited to 415 V, 3.3 KV or 11 KV services, fibre optic cable and telecommunications are assumed and that excavation methodologies are employed to mitigate damage, such as:
  - using only batter bucket on machines for excavation work;
  - manually dig carefully across the trench, 50 to 100 mm at a time, and then remove spoil with bucket;

- a *Spotter* is in place to identify tell-tale signs such as changes in soil type (strata types, sand or small aggregate), or underground marker tape, conduit, bricks or concrete
- all services encountered are assumed to be live.
- The Job Hazard Analysis, Permit to Excavate and excavation methodology shall be available at the worksite at all times during the excavation.
- The *Excavation Supervisor* shall ensure that all cables, pipelines and services exposed by preliminary Excavation are inspected by a competent person.
- The Excavation Permit will remain valid for no more than seven (7) working days, unless stated shorter on the Excavation Permit.
- Where a drill program has been supplied, then the permit may remain in place for the period of that program, providing that the boundaries of that program are not breached.

6.8.1 Discovery and Reporting of Unknown Services

If an unidentified or unknown service is discovered, the *Excavation Supervisor* shall:

- initiate a Stop Work Authority and cease excavation operations;
- barricade the area; and
- notify the *Excavation Permit Approver*, Southern Ports Representative .

6.8.2 Discovery and reporting of protected or dangerous materials and objects

Discovery and reporting of potentially fibrous containing materials

If suspected fibrous or Asbestos Containing Material is found, the *Permit Requestor* shall follow the guidance provided in the Southern Ports Reporting Suspected Fibrous Asbestos Material Safe Work Instruction.

- The suspect material must be reported to a Southern Ports representative immediately.
- The suspected asbestos containing material is not to be disturbed or handled and should remain in situ.
- The immediate area where the material is located should be marked with appropriate signage and cordoned off.
- The area will then be inspected by a Southern Ports Representative. Environment staff will be notified if soil contamination is suspected.

Discovery and reporting of skeletal remains or Dangerous Objects

If during excavation either skeletal remains or dangerous objects such as unexploded ordinances are uncovered, the below process must be followed:

- All work in the vicinity of skeletal remains is to cease until cleared by coroner or police to recommence
- Notification of finding is to be immediately reported to Southern Ports Representative in accordance with “Incident Event Management Procedure” for a notifiable event
  - The Regional Manager or authorised delegate (i.e. Safety Manager) is to notify both WorkSafe via the notifiable incident phone line and the local Police.
- The scene must be preserved as much as reasonably practicable:
  - A 10m radius around the site shall be fully barricaded with only one gated entry point to prevent unauthorised access
  - A tarp or other weather protections is to be established
  - Traffic control established if required.
- Internal incident report to be completed however no investigation is required as this remains the jurisdiction of the coroner in conjunction with the appropriate authorities

Discovery and reporting of cultural heritage materials or other relics

If during excavation either cultural heritage materials or other relics are uncovered, the below process must be followed;

- All work in the vicinity of heritage materials or relic is to cease until cleared by authorities to recommence.
- Notification of finding is to be immediately reported to Southern Ports Representative in accordance with “Incident Event Management Procedure” for a notifiable event
  - The Regional Manager or authorised delegate (i.e. Sustainability or Environment team member) is to consult with Department of Planning, Lands and Heritage for advice on determining heritage relevance and next steps.
  - The ACHknowledge portal is the preferred method for reporting potential aboriginal sites or objects.
- The scene must be preserved as much as reasonably practicable:
  - A 10m radius around the site shall be fully barricaded with only one gated entry point to prevent unauthorised access
  - A tarp or other weather protections is to be established
  - Traffic control established if required.
- Internal incident report to be completed however no investigation is required as this remains the jurisdiction of the coroner in conjunction with the appropriate authorities

6.8.3 Generation and Disposal of Fill

All material removed during excavation (fill) if excess to requirements shall be retained at Southern Ports.

The *Excavation Supervisor* and *Project Manager* shall consult with the Ports Environment Department to determine the location for temporary stockpiling, sampling and analysis requirements, and disposal controls.

6.9 Confined Space

A Confined Space is an enclosed or partially enclosed space that is not intended or designed primarily for human occupancy. During installation, a structure or aspect of a structure may be classified as a confined space. These structures included but are not limited to a drainage line, draining pit, interceptor pit or a pond.

Southern Ports manage the risks to health and safety associated with confined spaces, including entering, working in, on or in the vicinity of a confined space and the risk of a person inadvertently entering a confined space. Hazards that may be encountered in a confined space include:

- flammable gases or vapours, toxic gases or vapours, flammable, combustible or toxic liquids or solids, or potentially explosive dusts;
- oxygen deficiency or excess;
- physical agents, for example thermal extremes, radiation, noise or flooding
- engulfment; and
- mechanical equipment.

A wide range of injuries can be sustained from working in a confined space including:

- burns
- electrocution
- asphyxiation and suffocation
- poisoning
- brain damage and death, and

- crush injuries.

A Risk Assessment must be carried out by a competent person before workers enter confined spaces. Identified risks must be eliminated or minimised and a confined space entry permit issued for the work.

A Confined Space Evaluation shall be conducted to identify the hazards, assess the risks and to identify the required controls for the space. In addition, a Confined Space Emergency Response Plan shall be developed and communicated prior to entry into a confined space.

All potential Confined Spaces, which personnel may need to enter, shall be registered on a Confined Space Register for each Port.

Refer to the Southern Ports Confined Space Entry Procedure for guidance when assessing a potential confined space. Further information on how to work safely in confined spaces can be found in the Confined spaces – Code of Practice.

6.10 Survey Data

The Permit Requestor shall ensure that all new underground services installed are surveyed by a competent Surveyor prior to back filling. On completion of the excavation project the Permit Requestor shall submit the 'As Built' survey data captured to gis@southernports.com.au, prior to closing the permit.

The survey data submitted to Southern Ports GIS should be in the following formats:

- X, Y, Z real world coordinates ESP2020, AHD (preferred), MGA2020 Zone 51, or using the GDA2020 datum.
- Shapefile format preferred with detailed attribution of infrastructure identified (for example depth of pit, cable or conduit; type; number of conduits; sizes; direction of heading).

For points, tabular data is acceptable. For lines or polygons 3D CAD format is acceptable as long as attribution is clearly indicated for each feature.

The Metadata should be submitted as text file or word document which includes:

- date of the survey;
- coordinate reference system - horizontal and vertical;
- an accuracy statement - horizontal and vertical;
- the company name;
- the surveyors' name, email address, phone number; and
- any surveyor notes.

Any queries regarding GIS or the submission of survey data should be referred to gis@southernports.com.au.

7 REFERENCES AND RECORD MANAGEMENT

7.1 Permits and Authority to Work

Where works are conducted under an Excavation Permit or Penetration Permit, on completion of the works, the Southern Ports *Project Manager* or *Supervisor* should return the completed Permits to the issuing authority. The *Maintenance & Operations Administrator* will then scan and file the Permits into the Administrator Asset Management Database.

7.2 Exposure Standards

To comply with the Work Health and Safety (General) Regulations 2022, monitoring of workplace contaminant levels for chemicals with exposure standards may be necessary. The results of air monitoring must be recorded and kept for 30 years after the date the record is made.

7.3 References

7.3.1 Legislation, Standards and Codes of Practice

Legislation, Standards and Codes of Practice referenced by this Excavation and Penetration Procedure are shown in Table 2 below.

Table 3: Legislation, Standards and Codes of Practice

Reference	Title
	Aboriginal Cultural Heritage Act 2021
	Aboriginal Cultural Heritage Regulations 2022
Safe Work Australia	Excavation Work – Model Code of Practice
Safe Work Australia	Managing the work environment and facilities – Code of Practice
AS/NZS 1892	Portable Ladders – Western Australia
AS 2865:2009	Safe working in a confined space
AS 1319:1994 (2018)	Safety signs for the occupational environment
AS 4744.1:2000	Steel shoring and trench lining equipment, Part 1: Design
Main Roads WA	Traffic Management for Works on Roads – Code of Practice
	Work Health and Safety (General) Regulations 2022
	Work Health and Safety Act 2022

7.3.2 Southern Ports Documents

Southern Ports documents referenced in this Excavation and Penetration Procedure are shown in Table 3 below.

Table 4: Southern Ports Documents

Reference	Title
D23/2427	Authority to Work
D23/6142	Authority to Work and Permits Procedure
D18/2169	Barricading, Guarding and Signage Procedure
D20/415	Confined Space Entry Procedure
D23/1204	Engineering Design Guideline
D18/8795	Environmental Policy
D19/6478	Excavation Permit
D18/15172	Heritage Policy
	Isolation and Tagging Procedure
D22/788	Penetration Permit
D18/11692	Risk Management Framework
D17/3943	Scaffolding Procedure
D18/15171	Security Policy

Table 4: Southern Ports Documents

Reference	Title
D20/7758	Work at Height Procedure
D18/24902	Work Health and Safety Management Plan

7.4 Definitions

Terms used in this Excavation and Penetration Procedure are defined in Table 4 below.

Table 5: Terms and definitions

Term	Definition
Angle of Repose	The angle of repose of a granular material is the steepest angle of descent or dip relative to the horizontal plane to which a material can be piled without slumping. At this angle, the material on the slope face is on the verge of sliding. The angle of repose can range from 0° to 90°.
Authority to Work	An Authority to Work (sometimes known as an Authorization to Work or Permit to Work) is a document approved by an authorised and competent Southern Ports *Supervisor*, *Manager* or *Superintendent* to authorise any task undertaken by a Contractor (or for simultaneous works conducted by Southern Ports employees) within a Port's marine or land boundaries.
Backfill	Material used for refilling excavations.
Barricade	A temporary material, device or systems consisting of either rigid or soft vertical and horizontal members designed to restrict or control access to a work area where there is a hazard that has the potential to result in injury to personnel or damage to plant. (refer to Southern Ports Barricading & Guarding Procedure)
Batter	The stable, formed slope of an excavation or earth bank, cut to an angle less that the natural angle of repose to prevent earth slippage.
Bench	An excavation cut in steps to provide horizontal bearing and sliding resistance.
Competent person	A person who has acquired through training, qualification or experience, or a combination of those things, the knowledge and skills required to do excavation or penetration tasks.
Control Measure	An action taken to eliminate or minimise health and safety risks so far as is reasonably practicable. A hierarchy of control measures is set out in the Work Health and Safety (General) Regulations 2022 to assist duty holders to select the highest control measures reasonably practicable. **Note** The Work Health and Safety (General) Regulations 2022 also refer to a control measure as a risk control measure or a risk control.
Code of Practice	Practical guidance to prevent occupational injury and disease in workplaces where excavation and associated earthworks are performed, to assist them to comply with the Act and Regulations.
DLGIRS	Department of Local Government, Industry Regulation and Safety
Excavation	Any disturbance of ground by manual or mechanical means, such as: digging, trenching, drilling, post hole boring, directional drilling, pot holing; or driving of star pickets, posts, piles and stakes; and soil sampling.
Hazard	A situation or thing that has the potential to harm a person. Hazards at work may include noisy machinery, a moving forklift, chemicals, electricity, working at heights, a repetitive job, bullying and violence at the workplace.
Health and Safety Representative	A *Health and Safety Representative* is a worker who has been elected by their work group under the Work Health and Safety Act 2022 to represent them on health and safety matters.

Table 5: Terms and definitions

Term	Definition
Job Hazard Analysis	A Job Hazard Analysis is a Risk Assessment required for tasks that require a Permit or non-routine tasks that do not already have a documented safe system of work. It focuses on the relationship between the worker, the task, the tools and equipment, and the environment and identifies control to reduce or eliminate the hazard. The Job Hazard Analysis must be reviewed prior to each task commencement to ensure risk controls remain adequate.
May, Should	Recommended, but discretionary.
Must, Shall, Will	Mandatory.
Penetration	Work which will compromise a manufactured structure that may contain concealed service, such as coring, cutting, chiseling, drilling or the insertion of a fastener.
Permit Requestor	The person who applies for the permit to excavate. Nominally the excavation project manager or supervisor.
Permit Requestor	The competent person supervising excavation or penetration work.
Permit Approver	An employee who is an Appointed Person authorised as an *Excavation Permit Approver*.
Permit Validity	Once issued, the permit is valid for the period specified on the permit.
Personnel	A person working at Southern Ports including Southern Ports workers, contractors, sub-contractors, clients, port users and visitors.
Potholing	The process of shallow excavation involving disturbance of the soil up to 500 mm depths to locate underground objects such as a water pipeline.
Project Manager	Southern Ports appointed person with overall responsibility for delivering a project to time, cost and quality objectives in line with the approved business plan (where applicable).
Risk Assessment	A Risk Assessment identifies hazards and the required controls to minimise risk to safety, health, environment and community. May include Safety in Design, Risk Assessment, Safe Work Method Statement, Job Hazard Analysis, Stop & Think, or a combination of the above.
Safe Slope	The steepest slope at which an excavated face is stable against slips and slides, having regard to the qualities of the material in the face, the height of the face, the load above the face and the moisture conditions for the time being existing. A safe slope does not flatten when left for a considerable period, there is no movement of material down the slope and the toe of the slope remains in the same place.
Safe System of Work	A documented safe system of work is specific to the task being conducted and identifies and controls all plant, equipment and environment risks at the location they are being conducted. Examples include a Job Hazard Analysis, Safe Work Instruction or Safe Work Method Statement. Additionally, for all high risk and non-routine repeated tasks or wherever there is a change to the task step, plant equipment or environmental conditions, a documented task level Risk Assessment must be completed or amended. For example, the documented safe system of work is amended to clearly identify additional hazards.
Safe Work Instruction	See Safe Work Method Statement.
Safe Work Method Statement	A Safe Work Method Statement is required under the Work Health and Safety Act 2022 for works considered high risk construction.

Table 5: Terms and definitions

Term	Definition
	A Safe Work Method Statement has a minimum format requirement which includes breaking the job down into a logical sequence of steps, identifies hazards, addresses control measures to mitigate risks, and identifies any specific competencies, and legislation referred to for the work, and identifies who is responsible for implementing the controls. A Safe Work Method Statement assists in ensuring that all workers are consulted and have a full understanding of the risks involved in the work activities, or tasks they are performing, by setting out instructions required to conduct a job.
Safety in Design	The integration of control measures early in the design process to eliminate or, if this is not reasonably practicable, minimise risks to health and safety throughout the life of the structure being designed.
Sign	An inscribed board, plaque or other delineated space on which a combination of legible writing and symbols is used to convey a message, Danger – Excavation in Progress.
Soil Sampling	Sampling of soil (except for stockpile sampling above the natural ground level of previously disturbed soils)
Southern Ports Representative	An appointed Southern Ports employee responsible for managing work activity. For internal staff, this will be the line manager. For contractors this will be the project manager.
Surcharge Load	A load which is imposed upon the surface of the soil adjacent to the excavation to cause a lateral pressure on the excavation. Surcharge load may include but not limited to excavated soil, surface mobile plant or a structure.
Subject Matter Expert	an individual with deep, specialized knowledge, extensive experience, and unique expertise in a specific subject, field, or domain, making them an authority on the topic
Trench	A long, narrow, open excavation in which the horizontal width across the top is less than twice the vertical depth of the deeper side.
Workers	Workers at Southern Ports include Employees, Contractors and consultants who are performing work – but not Visitors.
Workplace	An area, ship, vehicle, building, or other structure, where employees work or are likely to occupy in the course of their work.

APPENDIX A: PERMIT TO EXCAVATE WORKFLOW

Table 6: Permit to Excavate workflow

#	Step	Active Contribution	Accountable
1.	Prepare construction systematic drawings for all proposed underground services or structure. Initiate a Safety in Design and Construction Risk Assessment for complex excavations being undertaken by a contractor.	Permit Requestor	Permit Requestor
2.	Develop the application for an Excavation or Penetration Permit.	Permit Requestor	Permit Requestor
3.	Mark out the actual excavation, indicating the excavation limits. Use white mark out for the excavation limits.	Permit Requestor	Excavation Supervisor
4.	Raise purchase order for subsurface scanning and surveying.	Permit Requestor Project Manager	Permit Requestor Project Manager
5.	Review systematic and ArcGIS drawings.	Permit Requestor	Permit Requestor Project Manager
6.	Contact *Safety Advisors* to check for the presence of potential Asbestos Containing Materials.	Permit Requestor	Permit Requestor Permit Approver
7.	Walk over job location, identify hazards, mark area for excavation to be scanned and all known services • Red mark out for area to be scanned • Orange mark out for known services.	Local knowledge personnel Engineering Project Manager Excavation Supervisor	Permit Requestor
8.	Receive drawings, perform scan, mark services/concerns found on drawings • All services found through the scan shall be marked out in Orange.	Excavation Supervisor Electrical Supervisor Mechanical Supervisor	Scanning Technician
9.	Complete Sections 1 to 4 of an Excavation Permit Application Form. Attach engineering systematic drawings, excavation Scope of Works and excavation methodologies. Submit the *Excavation Permit Application* to the *Permit Approver*.	Permit Requestor	Permit Requestor
10.	Determine and record the excavation control conditions in Section 5 of the *Excavation Permit Application* and authorise the *Excavation Permit*.	Electrical Supervisor	Permit Approvers
11.	Explain excavation control measures to *Excavation Supervisor*, ensuring controls and permit conditions are understood and acknowledged.	Electrical Supervisor	Permit Approvers
12.	Develop the excavation Job Hazard Analysis to reflect the environmental conditions, authorised excavation methodology and permit conditions.	Excavation Team	Excavation Supervisor
13.	Conduct Pre-start meeting with the Excavation team.	Excavation Team Project Manager	Permit Requestor Construction & Excavation Supervisor
14.	Sign on to Permit to Work and the Job Hazard Analysis for the excavation work.	Excavation Team	Permit Requestor Construction & Excavation Supervisor
15.	Commence excavation.	Excavation Team	Permit Requestor Construction & Excavation Supervisor