

SAFE WORKING GUIDELINES EXCAVATIONS

1. Introduction

The objective of this procedure is to prevent the occurrence of injury and reduce the severity of injuries resulting from falling into or the collapse of an excavation and striking services that are either unknown or their assumed positions are inaccurate

2. Purpose

The purpose of this document is to provide suitable information for the identification, assessment and control of hazards associated with Excavations.

3. Definitions

Excavation	including the excavation or filling of trenches, ditches, shafts, wells, tunnels, pier holes and the use of caissons and cofferdams;
Plant	means any machinery, equipment, appliance or tool;
Zone of Influence	generally a 45 degree angle out, from the base of the excavation

4. Roles & Responsibilities

Project Managers/ Supervisors and Site Supervisor are responsible for the following:

- Identification, assessment, control and evaluation of excavation hazards;
- Ensure that all plant and equipment is properly maintained, eg roll bars, noise control measures like silencers, reversing beepers
- Ensure excavation permits Doc no: OHS103, Dial before you dig 1100 permit and other safety requirements have been documented prior to any excavating.

Employees / subcontractors are responsible for the following:

- Co-operate with Project Managers/Supervisors and Site Supervisor in implementing the excavation management controls;
- Ensure plant and equipment that is properly maintained is only used.

5. Procedure

Employees and subcontractors are responsible for developing an understanding of an becoming competent in the implementation of risk management principles and practices on site/s.

This is a four phase process:-

1. Risk Identification
2. Risk Assessment
3. Risk Control
4. Risk Evaluation

5.1 Risk Identification

Identification of risks associated with Excavations should be undertaken by the following means:

- Consultation with employees / subcontractors
- Observation of work practices
- Inspections of the task and associated work areas
- Examine workplace injury records to assess what falls / collapse incidents have occurred to what tasks being carried out.

5.2 Risk Assessment

Identified hazards should then be prioritized according to the severity of injury, frequency of task and probability whilst performing the task. When assessing the risk, consideration will be given to:

- Occupation or job/task of the person exposed
- Work environment
- Duration and frequency

The following hazards are commonly associated with excavation work and should be considered during the risk assessment process:

- the fall or dislodgement of earth and rock;
- falls from one level to another;
- the instability of the excavation or any adjoining structure;
- the inrush or seepage of water;
- unplanned contact with utility services ie electricity cables and gas mains;
- the placement of excavated materials;
- falls into excavations;
- falling objects;
- the movement and positioning of heavy plant and equipment effecting the excavation;
- ground vibration affecting the stability of the excavation;
- vehicle movement;
- excessive noise from the operation of any machinery and plant;
- manual handling injuries;
- Changes to excavations conditions
- the instability of the excavation due to persons or plant working adjacent to the excavation;
- overhead essential services (powerlines) and ground mounted essential services (transformers, gas and water meters).

The following table lists common hazards associated with excavation work and examples of control measures:

Potential hazards	Examples of control measures
Ground collapse	The use of benching or the installation of ground support (eg shoring)
Water inrush	Pumps or other dewatering systems to remove water and prevent build-up
Falls	Ramps, steps or other appropriate access into the excavation
Hazardous manual tasks	Rotating tasks between workers
Airborne contaminants	Mechanical ventilation to remove airborne contaminants
Buried contaminants (eg asbestos)	Training to identify buried contaminants and what action to take
Underground services	Obtain information from the relevant authorities on the location of underground services.

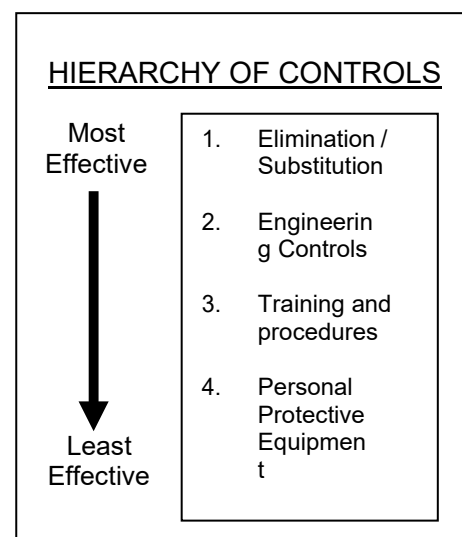
5.3 Risk Control

It is the responsibility of all employees and subcontractors involved in the excavation hazard management process to ensure that control measures that are put in place by Proline are co-operated with. Risk Control is the means for minimizing or eliminates the identified risk and is carried out using the following heierarchy of control:

- *Eliminate the risk by ceasing the hazardous component or activity*
- *Substitute a less harmful alternative hazard substance or process*
- *Isolate the hazard at source using engineering means*
- *Introduce administrative controls to minimize exposure*
- *Use of Personal Protective Equipment*

When considering control options the following should be considered:

- The depth of the excavation;
- The nature of the strata – sand, clay, shale, floaters etc including their likely behavior upon exposure to the elements
- Fractures or faults in rock;
- The presence of moisture or water;
- The possibility of exposure to wet weather and water from other sources;
- Any load close to the edge or in the zone of influence of the excavation;
- Vibration;
- The exposure time;
- Any previous disturbance of the ground, ie previous excavations;
- Adjoining buildings and structures;
- Checks on Plant & Equipment;
- Training of personal.



Step 1.



The Essential First Step.

Figure 1

Underground essential services exposed by 'potholing'

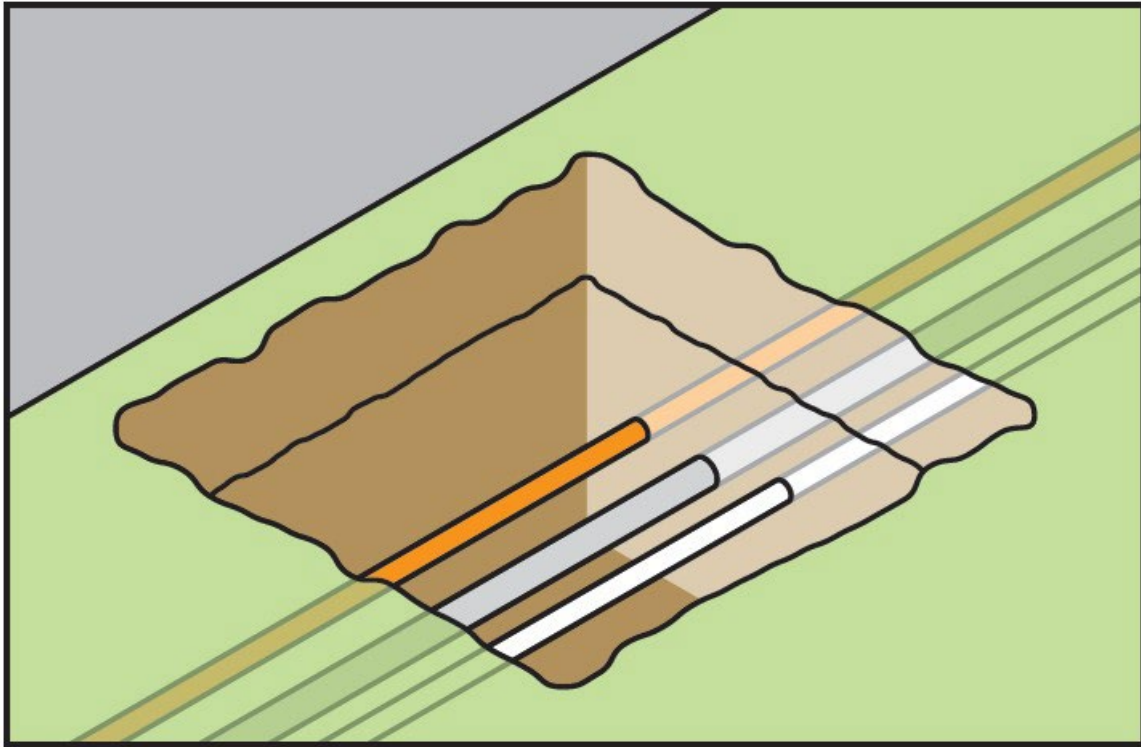


Figure 2

Excavated material and loads near excavations

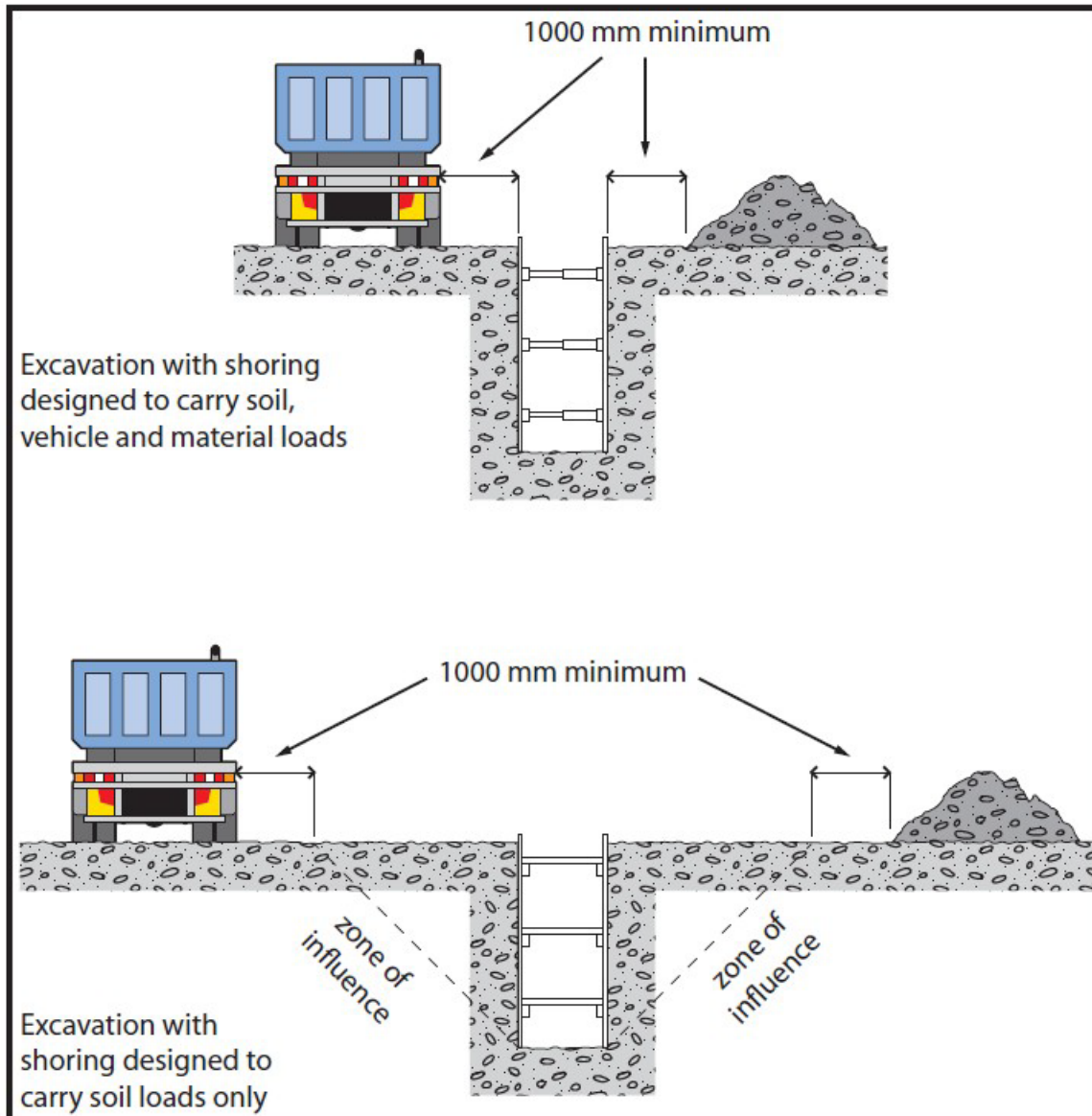
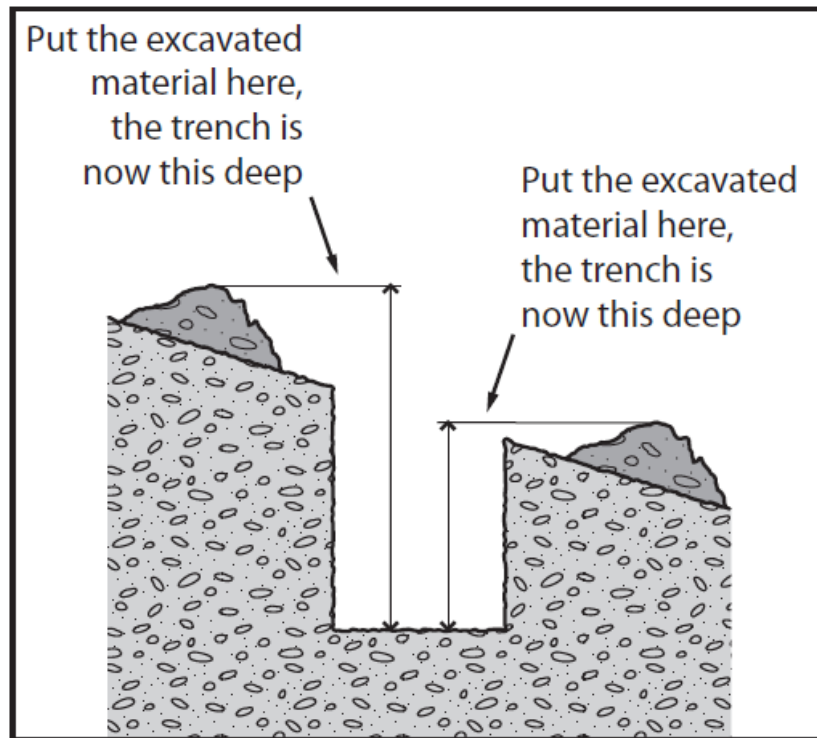


Figure 3

Excavated material impact on effective excavation depth



5.4 Risk Evaluation

It is important to evaluate the effectiveness of the control measures implemented, to ensure that they are effective and that they do not lead into the introduction of additional hazards within the work environment. An evaluation of control measures must be carried out by the Site Supervisor during the tasks Safe Work Method Statement Reviews.

6. Procedure

6.1 Planning – Project Manager / Site Supervisor

- Ensure all temporary site services are fully recorded and coordinated.
- Ensure that redundant services are removed where reasonably practical and that any retained are properly marked on As-built records.
- Maintain the database of information relating to on-site services.
- Liaise with individual Design Teams with regards pooling/sharing of information relevant to services.
- Maintain temporary files of installed services, removed and redundant services pending the issue of As-built drawings from the relevant Site Team.
- Maintain a record of new installed services for use by Teams requiring permits to dig.
- Emergency Contact details for all existing services identified as crossing/intersecting/being adjacent to the works area must be included within the safe work method statement.
- The Project Manager/Site Supervisor shall:-

Pre Start:

- Arrange planning meetings with services owners to agree requirements for required Safe method statement reviews, approvals and inspection schedules.

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Ensure that the various designers collate and supply the latest available services information.

- Review and approve the schedule of services affected for each work package against the latest version of the services information.
- Give instructions as required for surveys and trial holes to be undertaken to accurately locate services.
- Prepare or review the Risk Assessment/Safe Work Method Statement.
- Issue the reviewed Safe Work Method Statement to the Systems Manager for approval.
- Approve the issue of a Permit to Excavate Doc No: OHS103 for excavation works.

On Site:

- Ensure all services identified from information supplied by Service Providers or owners are located and clearly marked on site.
Offsets to marked locations should be considered.
Inspect work and adjacent areas to note access chambers, evidence of previous excavations or property service inlets that may indicate other services.
- Scan full area of the work to check for uncharted services.
- Contact the local authorities to obtain their records by services in the proposed work zone, e.g. obtain details from "Dial Before You Dig". (these documents should only be used as indicative only)
- Place warning signage and barricades around as required
- Review the Risk Assessment/Safe Work Method Statement on site with the work crew.
- Brief workforce involved on task in working methods, permit requirements and control measures including any system owner limit of access.
- Obtain signatures of all workers to demonstrate they have received and understood the briefing. This must include any additional/replacement workers who may become involved in the task as it progresses.
- Hold a toolbox talk with entire site workforce prior to commencing work to explain work method and risks associated with the planned works.
- Sweep the area immediately ahead of workface to double check for uncharted services or services which may deviate from planned route.
- Issue a Permit to Excavate Doc No: OHS103 for excavation works

During the work:

- Respond to any call advising location of uncharted services, inform UTILITY SERVICES PROVIDER.
- Ensure that the validity of the Permit to Excavate Doc No: OHS103 is maintained for the duration of the works.
- Monitor and inspect the works on a regular basis to ensure approved methods are used in their execution. If not completely satisfied with the control measures, stop work until any problems have been rectified.
- Assist in any works inspections required.
- Ensure work is stopped if circumstances require a change to the safe work method statement, sequence or equipment, and have the risks re-assessed and safe work method statement amended and reapproved as necessary.
- Ensure excavation is secured at the end of each shift
- Permit to excavate Doc No: OHS103 has been closed out at the end of each shift.

7. Shoring / Benching or Battering

A shoring system is not required, if having regard to the nature of the excavation, when an excavation is no more than a height of 1.5m. A shoring system may include any suitable system

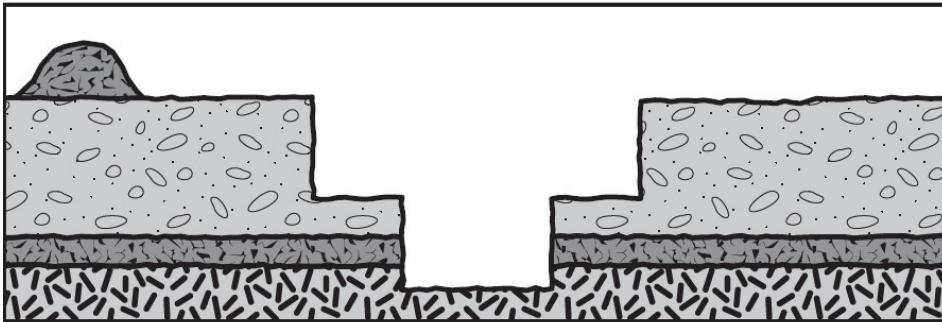
of temporary supports and sheeting materials used to maintain the stability of the sides of the excavation. Types of Shoring and support systems include, but not limited to:

- Sacrificial sets – stay in the ground indefinitely, maybe timber or concrete;
- Solider sets – timber, steel proprietary;
- Trench supports (eg shields, boxes or cages etc)
- Sheet piling
- Precast panels
- Diaphragm walls
- Rock bolts and ground anchors
- Caissons
- Sand bags (sand cement mix)
- Hydraulic systems
- Soil nails, shotcrete
- Pneumatic systems

Benching and battering are methods which minimize the risk of the soil or rock slipping into the excavation. Benching is the creation of stepped sides into an excavation. Benching is carried out by forming steps in the vertical wall, to reduce the height of the wall. Battering is where the wall of the excavation is sloped back on an angle. When benching or battering of an excavated wall, an angle of less than 45 degrees should be used, unless certified in writing by a suitably qualified geotechnical engineer.

Figure 9

Benching



Battering is where the wall of an excavation is sloped back to a predetermined angle to ensure stability (see Figure 10). Battering prevents ground collapse by cutting the excavated face back to a safe slope. Battering should commence from the bottom of the excavation and in some circumstances it may be appropriate to use a combination of the two methods on an excavation (see Figure 11).

Figure 10

Battering

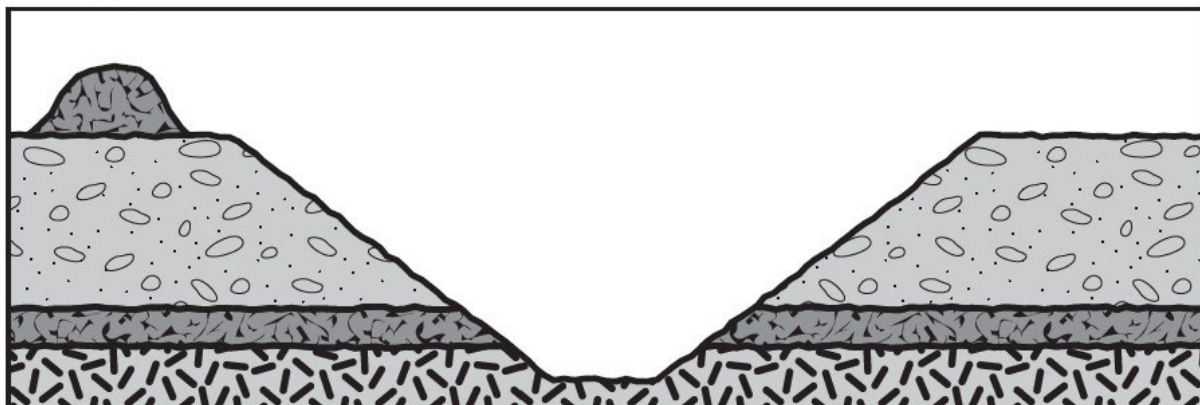
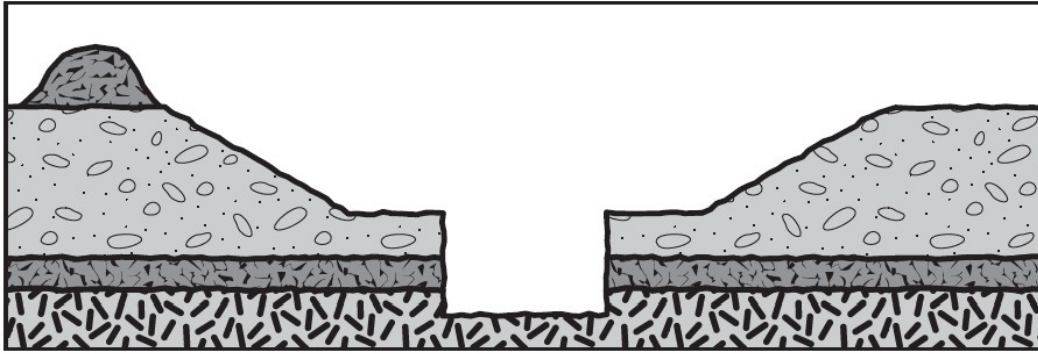


Figure 11

Combination of benching and battering controls



Benching and battering of excavation walls can minimise the risk of soil or rock slipping onto the excavation. Control measures should be designed by a competent person (eg geotechnical engineer) and be relative to the soil type, the moisture content of the soil, the planned height of the excavated face and any surcharge loads acting on the excavated face.

Ground collapse is one of the primary risks to be controlled in excavation work. Ground collapse can occur quickly and without warning, giving a worker virtually no time to escape, especially if the collapse is extensive. A buried worker is likely to die from suffocation before help arrives (eg either the head is buried, or the chest is so restricted by the weight of ground that the worker can no longer breathe).

Figure 8 shows a typical example of ground failure where material collapses onto a worker pinning them against the wall of a trench. Trench collapses of this nature can cause fatal injuries.

Figure 8

Trench collapse and associated ground forces

a. This is a very dangerous situation, requiring ground support. No worker should be in the trench > 1.5m deep unless support has been installed.

1. Area of tension, as wall starts to collapse.
2. Slipping plane.
3. Seepage along the slipping plane further reduces the stability of the wall. Water seeping into the excavation, tension cracks on the surface and bulging side walls are all signs of imminent collapse.

Seepage in trench bottom may not be obvious until the actual collapse.

b. Shear plane failure along the seepage (slippage) plane.

c. Worker trapped and crushed against the trench wall by the quick collapse.

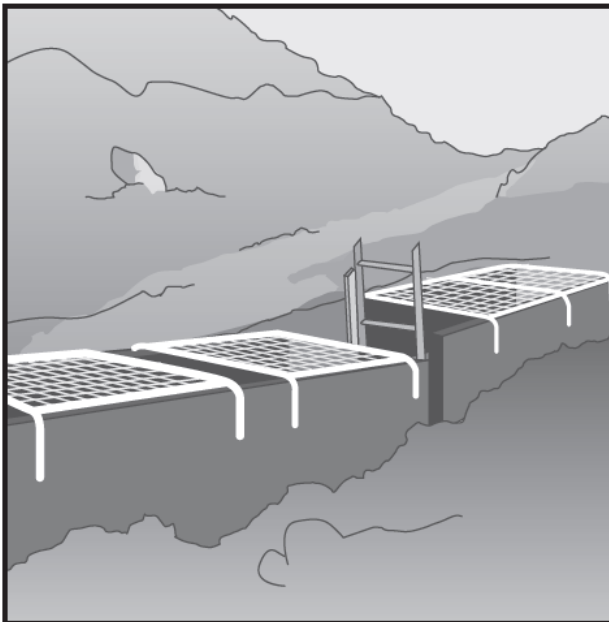
d. Worker badly injured and probably smothered after being crushed against the opposite wall by the collapsing ground. The weight of a wedge of sand over a one metre length of trench two metres deep is about three tonnes

8. Security of Excavations (Fall Prevention / Barricades)

It is the responsibility of Proline to provide a safe working environment. Falls into open excavations, injuries as a result of plant not being immobilized and people struck by plant are all incidents which are preventable. Control measures should be considered when conducting a risk assessment in order to determine the controls in which will be implemented to ensure the security of the excavation during the works and when the worksite/s is left unattended.

- Isolating the hazardous area, by means of barricades, perimeter fencing, handrails, screens, and / or where covers are capable of preventing access or fall of a person/s;
- Removal or lowering of ladders on with work site;
- Immobilization of plant to prevent unauthorized entry;
- Hazard warning lights, signs, markers or flags;
- Site Security measures, including fencing
- Night Lighting.

Steel mesh covers over trench shields



Fencing around excavations to secure



9. Overhead Services

- Overhead services are a common hazard on construction sites.
- Overhead services require identification in regard to the type and voltages to determine the required exclusion distances which are included in the relevant standards.
- Overhead services may be marked e.g. “tiger tails” or an exclusion zone formed at ground level using barriers. The use of “goal posts” should also be considered.
- Where a risk of contacting services exists an accredited operator and spotter must be used.
- A risk assessment must be conducted prior to work commencing and alternatives such as power outage or different work methods considered.
- This also applies to any stock piling of materials that may bring plant closer to the exclusion zone.
- Slew limiters, either mechanical or electronic, should be considered.
- Overhead services must be included in any excavation permit Doc No: OHS103 and be included in SWMS to provide a clear understanding of the hazard prior to work crews commencing any works



Identify with signage



De-energise / installation of tiger tails

10. Plant Operator/s

Figure 4

Mobile plant operator blind spots

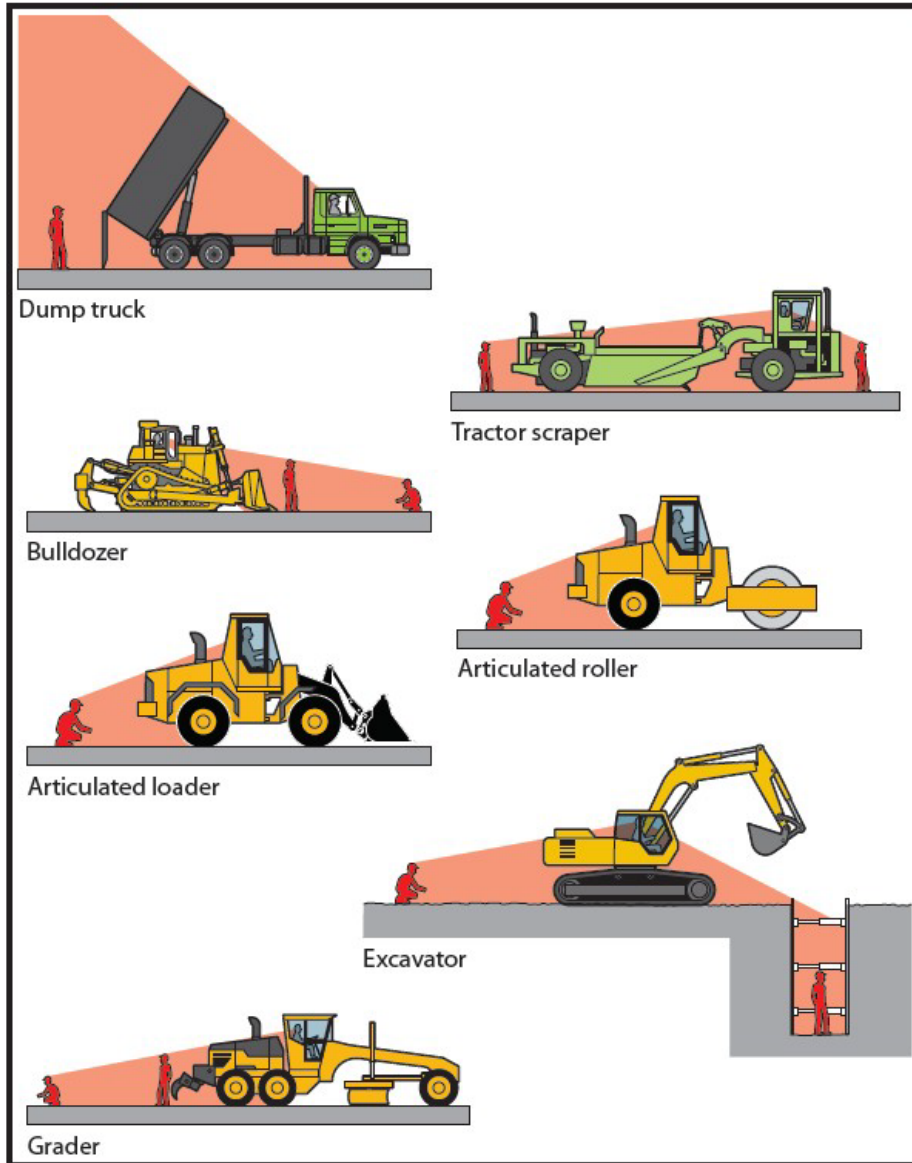
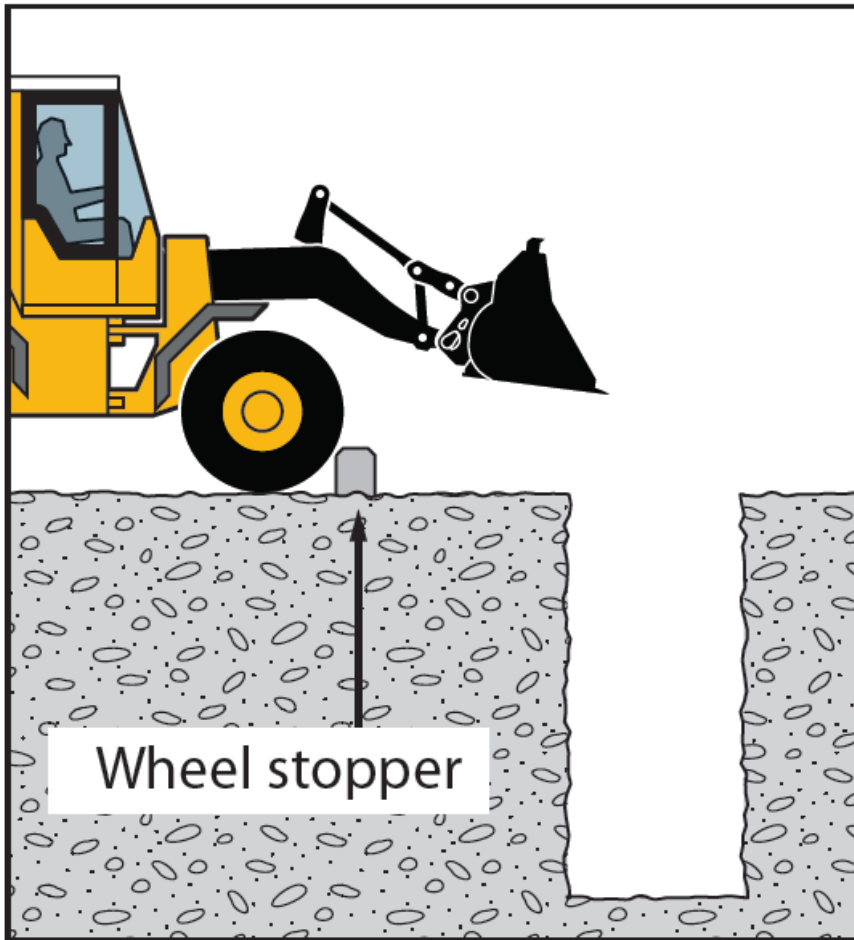


Figure 5

Preventing plant operation near excavations



11. Manual Excavations

Manual excavations methods are generally used for small, shallow excavations, less than 1.5m deep in soft soils.

When working in close proximity, workers should be kept as far apart to prevent injury from the use of picks or other hand tools. This applies particularly to work in trenches and small excavations.

Manual handling techniques should be used when carrying out manual excavations, refer to Manual Handling Safe Working Guide.

12. Training

The Systems Manager will train employees during WHS EMS QA Seminars to ensure that employees can identify risky activities and receive appropriate training.

Project Manager/Supervisors should ensure Site Supervisor train employees / subcontractors in identifying, assessing and controlling falls into, collapse of and general hazard control associated with excavations during Safe Work Method Statement training. Site Supervisor should ensure the person/s being trained understand the reason for performing the task with the least

amount of risk, can recognise the risks and decide the most appropriate method to complete the task and can perform the task in the correct way.

13. Review & Evaluation

In order to ensure this procedure remains effective, it will be reviewed by Senior Management on an annual basis or in the event of an injury or near miss resulting from any noisy activity, changes in legislation or if raised by an employees concern.

14. References / Legislation

- Work Health & Safety Act 2011
- Work Health & Safety Regulation 2017
- Workcover COP Excavations March 2000
- Excavation Work Code of Practice 2014
- Model Code of Practice – Excavation Work 2015

15. Version Control

Date	Version	Owner	Comments
14.05.09	1	Michelle Noy	For Issue
14.02.11	2	Michelle Murphy	Inclusion of Overhead Services
11.11.11	3	Michelle Murphy	Following External 3 rd Party Audit
18.04.12	4	Michelle Murphy	Changes in legislation
02.07.15	5	Michelle Murphy	Following Management Review
19.02.16	6	Michelle Murphy	General Update
1.09.17	7	Michelle Murphy	General Review
01.06.18	8	Michelle Murphy	Changes in legislation
1.12.23	9	Michelle Murphy	General Review