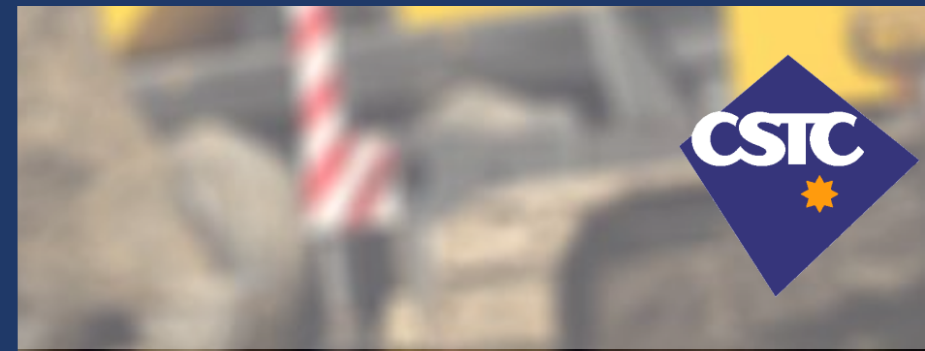




CARRY OUT MANUAL
EXCAVATION

RIICCM205E



Overview

In this unit you will achieve understanding of the following 4 Elements.

- Element 1: Plan and prepare for manual excavation
- Element 2: Dig small excavations by hand
- Element 3: Complete and isolate the excavation
- Element 4: Conduct housekeeping activities.

SAFE WORK METHOD STATEMENTS (SWMS)

Safe work method statements (SWMS) assist a PCBU to consider how certain activities will be carried out safely. The following should be noted:

- SWMS must be easy to understand, signed and dated;
- SWMS must be amended if there is a change in the activity and a copy must be given to the principal contractor;
- All persons affected by changes must be advised of amendments to the work method statement.

JOB SAFETY ANALYSIS (JSA)

- A job safety analysis is a procedure which helps integrate accepted safety and health principles and practices into a particular task or job operation. In a JSA, each basic step of the job is to identify potential hazards and to recommend the safest way to do the job.
- Identifies hazards and potential hazards that may be encountered while working.

WORK INSTRUCTIONS

- Work Instructions are documents that clearly and precisely describe the correct way to perform certain tasks that may cause inconvenience or damage if not done in the established manner. That is, describe, dictate or stipulate the steps that must be followed to correctly perform any specific activity or **work**.

EMERGENCY PROCEDURES

- Even if control measures have been put in place, a leak, spill or uncontrolled release of a hazardous chemical may still occur. Emergency procedures should be established and used if appropriate to enable the source of a release to be safely identified and repairs to be made. All persons not directly concerned with the emergency should be excluded from the area of contamination.
- Outline what to do in the event of fires and other accidents.

Preparing an Emergency Response Plan

(to be planned before work commences so procedures can be followed without delay)

The emergency response plan should be prepared in consultation with the workers at the workplace and emergency service agencies where appropriate.

The issues which should be addressed in an emergency plan include the following:

- Locations of first aid kit and fire extinguisher
- Phone numbers of key personnel ie, fire department, doctors etc.
- Locations of the hazardous chemicals, personnel, equipment and emergency control rooms at the workplace, and
- Evacuation arrangements.

SAFETY DATA SHEET (SDS)

A safety data sheet (SDS) – previously called material safety data sheet (MSDS) - provides information which allows for the safe handling and use of substance/materials in the workplace. It describes:

- The identity of the product e.g. formulation or chemical name
- The properties and uses of the product health hazard information precautions for use
- Safe handling information
- First aid instructions
- Methods for safe disposal
- Identify materials/substances that the product is incompatible with
- It is important that all waste material is removed from the construction site. This may include: construction materials, oils and fuel, garbage materials such as empty containers, wrappings, excavated soils and rock

TRAFFIC CONTROL PLAN (TCP)

- **Traffic control plans** (TCP's) are detailed drawings that show the layout of temporary road signs and devices to warn and guide **traffic** past, around and through the work site safely. A TCP is part of a work health and safety (WHS) requirement of a worksite
- Outline requirements for site isolation and signage for vehicles.

PLANS

Before commencing any job, you will usually receive specific work instructions which will include plans. The main purpose of plans is to provide a visual representations of the work to be undertaken. If there are hazards and discrepancies between plans and what is on site, a site manage, supervisor or project manager should be notified.

MANUFACTURER SPECIFICATIONS

Manufacturer guidelines and specifications must always be followed. By law these must be made available/provided at the point of sale by the manufacturer. Manufacturer guidelines and specifications can be available for anything on site, but most likely for materials, tools, equipment, heavy machinery, hazardous substances etc.

ENVIRONMENTAL MANAGEMENT PLAN (EMP)

- An Environmental Management Plan (EMP) is a site or project specific plan developed to ensure that appropriate environmental management practices are followed during a project's construction and/or operation.
- Addresses clean up management, noise control and waste management.

SIGNAGE REQUIREMENTS

Careful consideration should be given to signage on the worksite, no matter how brief the occupation of the site may be. This should include:

- Protection of workers
- Provision of adequate warning of changes in surface condition, and the presence of personnel or plant engaged in work on the road
- Adequate instruction of road users and their safe guidance through, around or past the worksite, and
- Safe access and egress to and from the worksite.

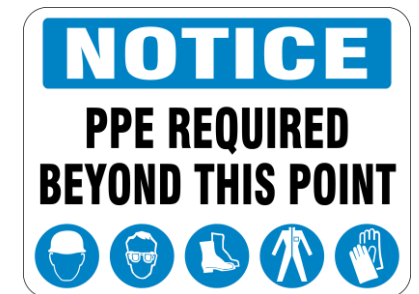
EXAMPLES OF SIGNS

The *Traffic Management for Construction or Maintenance Work Code of Practice 2008* notes the following:

The Manual of Uniform Traffic Control Devices Part 3 (MUTCD Part 3) provides the technical background, diagrams and guidance for the placement of temporary traffic control signs and devices used at road works.



DO NOT ENTER



PPE REQUIRED

PLANS AND LOCATION DETAILS

In identifying the physical location of services on site, you will need the utility plans and any other information you have gathered from other sources and any local knowledge you have accumulated over time. On site, there will be some obvious markers for services, but you must be aware that many services are not marked and there could still be some that you have not yet identified.

Telecommunications plans, and in some cases electrical plans, may provide a detailed representation of the service or network. When reviewing the information:

- Hold the plan/s or drawing/s so the “North symbol” faces the top; or
- If there is no “North symbol”, identify the streets or buildings nearby and position yourself so the streets correspond with the plan/s.
- Use the scale and measurements indicated on the plan/s to pinpoint your exact location.
- Determine if measurements are metric or imperial, or a combination of both.
- Identify nearby pipes or cables and mark their recorded location.
- Cross reference any supplementary plans or details.
- Identify any of the items listed below and assess their relationship to each other to determine if a measurement has altered:
 - Building lines
 - Pits and poles
 - Offsets
 - Turning points
- Assess the exact location of these services by hand or by using a pipe/cable locator.
- Note: Inaccuracies can and do occur, both on plans and in the ground. If in doubt, check with the service provider. Never guess!

ON-SITE MARKERS

Underground utilities can be located from the plans which indicate reference points as well as the distance between identifiers. These can be plotted onto the worksite using markers such as posts with coloured tops or flags, coloured spray paint, or other clearly identified method.

Some utility markers you will encounter on site are:

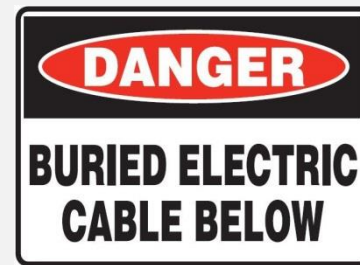
Telecommunications

Optic fibre markers are usually triangular in cross section and made of solid concrete or metal on top of a round post. Colours are generally white and yellow with black or grey writing. The location and direction of the service may be stamped on the marker.



Electricity

Generally, there are no above-ground markers for electricity and the only signs will be those attached to transformers. The best indication that electricity is present in the area is the presence of street lights and power poles in the vicinity.



Gas

There are two distinct types of gas utilities that you may encounter; the reticulated service provided to suburban homes and the bulk service pipelines, usually located in industrial areas. Gas utility signs are coloured white, black and red with distinctive "warning" signs. Gas pipelines are further identified by company, e.g. Boral, Incitee, Envestra, etc.



Water

Water services are marked for location by service personnel or emergency services. They may be indicated with a white post with "HP" on the top section, indicating a hydrant point, or a green post with AV for Air Valve on trunk mains.



GROUND MARKINGS

When workers identify the location of underground services they need to be marked so that other workers are aware of what is below the ground at that point. The following colours and symbols should be used.

COLOUR	SERVICE	SYMBOL EXAMPLES
Blue	Water	W
Green	Sewer	SE
Orange	Telecommunications/ Fibre Optic	TE
Red	Electricity	E (H/V & L/V)
Purple	Storm Water	SS
Yellow	Gas	HPGM or GM

DIAL BEFORE YOU DIG (DBYD)



Before obtaining plans you need to ascertain the location of the excavation and the duration of the excavation. Once you have this information ready you can contact dial before you dig to determine the location of underground services.

All information relative to the job site should be obtained prior to contact with service providers such as Dial-Before-You-Dig (DBYD). This includes information to enable the clear identification of the work site location, such as the street address, the nearest intersecting street etc., as described in the next section.

The Service/Utilities Owners provide plans to the inquirer within **48 hours** (unless it is a particularly large or difficult job) that give an indication of any underground services in the requested worksite. If the Service/Utilities Owners listed on your Caller Confirmation have not contacted you, or provided plans prior to commencing work you must take the initiative to phone them on the contact numbers provided.

TOOLS AND EQUIPMENT

Maintenance and Inspections

It is also essential that tools and equipment are checked for serviceability, and any faults are rectified or reported prior to commencement. This requires you to follow all workplace protocols for rectification and reporting applicable to your organisation. These protocols will require you to complete forms, place signage on equipment, and report faults to supervisors.

Remember: before you use any equipment identify if there is a maintenance schedule, ensure that there are no discrepancies and that it is signed off.

DEFECTIVE EQUIPMENT PROTOCOL



STOP

1

TAG

2

REPORT

3

RECORD

4

PERSONAL PROTECTIVE EQUIPMENT (PPE) FOR MANUAL

The following is a list of personal protective equipment, which you should use on site for your own safety when handling materials.

For undertaking manual excavation - head, eyes, face, hands, feet and body protection need to be worn.

If the activity is causing dust or small particles of debris - airway/lung protection will also be needed as well as hearing protection if the area is noisy. e.g. a jackhammer is being used.

- Head - safety helmets, sun hats;
- Eyes/face- safety spectacles, goggles, face shields;
- Hearing- ear muffs, ear plugs;
- Airways/lungs- dust masks, respirators;
- Hands- gloves, barrier creams;
- Feet- safety boots and shoes, rubber boots;
- Body- clothing to protect from sun, cuts, abrasions and burns



TOOLS AND EQUIPMENT

You need to select the right piece of equipment when undertaking manual excavation. This could include picks, crow-bars, shovels, hand augers, string lines, pegs, levels, tape measures, jack hammers or scabblers.

TOOL	DEFINITION
Shovels	• Shovels are used to move loose material from excavations. They aren't suitable for excavating large areas since they rely on manual labour. • Shovels need to be used correctly to help prevent manual handling injuries. • Before using a shovel you should check the joints between the handle, shaft and scoop as well as the blade for rust and degradation and after use you should clean and possibly oil the shovel to prevent rust and store the shovel where it won't be damaged.
Jackhammers	• Concrete breaking; scabbling/hacking (the roughening) of concrete surfaces to provide a key for; render or tiles); demolition of brickwork/masonry and general excavation; or tamping (repeated pounding of fill to consolidate it) • Check that hoses are fitted and points/tip are correctly attached. • Use appropriate techniques to help prevent strain. Operate the tool at a slight angle with it leaning back. Shut off the air supply and relieve pressure from the supply hose before changing tool points. • Not suitable for use on certain material (e.g. soft sands) • Clean after use.

TOOLS AND EQUIPMENT (CONT.)

You need to make sure that you know how to use each piece of equipment correctly. Because of the physical nature of doing manual excavation it is important to use the correct techniques to avoid manual handling injuries.

TOOL	DEFINITION
String Lines	• String lines are used to mark out straight lines between two points for excavations or concreting work. • They are also used with a plumb to provide a vertical line. • They aren't used to measure heights along a distance due to sag.
Crowbar	• Crow bars are used as levers to force two objects apart e.g. to break up hard soil and trim edges of excavations. They are not suitable for use on certain material e.g. soft sands. • Ensure that the object you are demolishing is secure and won't go flying through the air when pressure is exerted. • After use you need to remember to clean crow bars and possibly oil them to prevent rust.
Pick	• Picks are used for breaking up hard soil and rock and they aren't suitable for use on certain materials such as soft sands. • They need to be used correctly to help prevent manual handling injuries. • Check the joint between the handle and the end of the pick to ensure that it is secure before use and after you have finished using a pick you need to clean and possibly oil the pick to prevent rust.

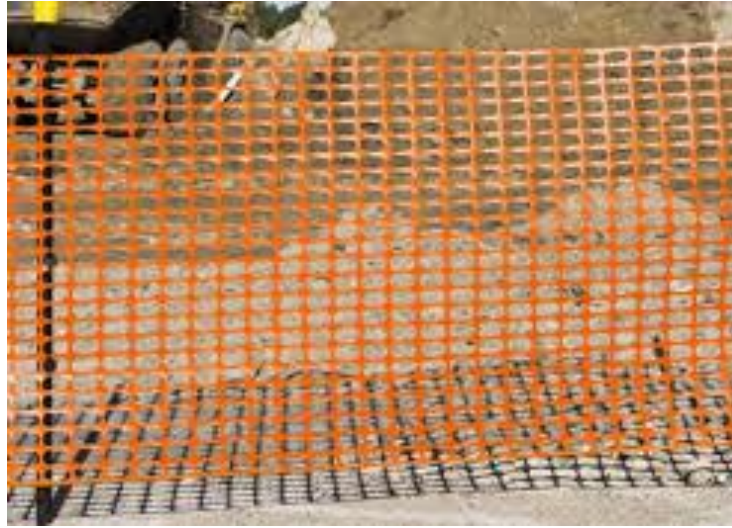
ISOLATE THE AREA

There are requirements in the WHS Regulation 2011 which aim to protect workers and others on site from the risk of falls by restricting access to an excavation area.

Additional controls—barricade or hoarding

A person with management or control of a workplace where excavation work is carried out must erect a barricade or hoarding at least 900mm high to restrict access by persons to the excavation unless—

- (a) the erection of the barricade or hoarding is impracticable; or
- (b) no person is likely to be in the vicinity of the excavation.



A **hoarding** is a self-supporting structure, fully sheeted with timber, plywood, metal or sturdy synthetic sheets, or fully covered by chain wire or sturdy mesh, that is designed—

- (a) to prevent persons other than the person conducting a business or undertaking or workers from entering a workplace where excavation work is being carried out; and
- (b) to provide protection to those persons against objects or material approaching them from the side.

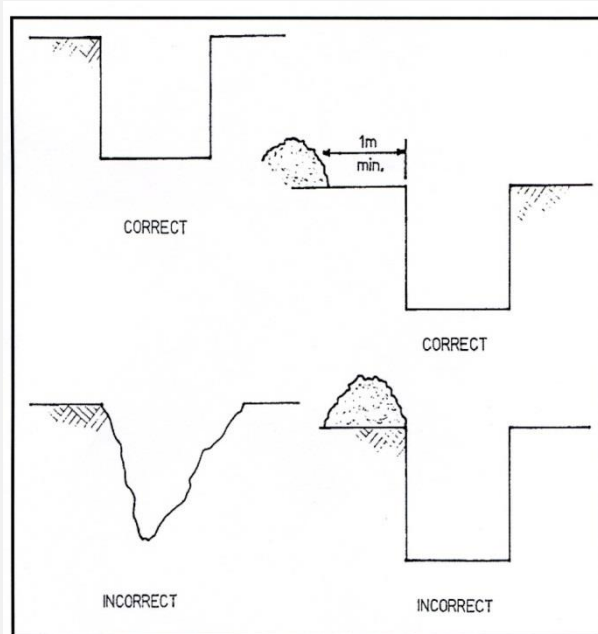
A **barricade** is a self-supporting fence, or a self-supporting series of continuous plastic, concrete or other solid barriers, usually temporary, erected or placed to restrict the entry of persons to a workplace.

Examples of fences include —

- steel pickets joined by chain wire of appropriate height to restrict entry
- steel pickets joined by rows of wire at appropriate heights to restrict entry
- steel pickets joined by taut plastic webbing commonly known as para-webbing



EXCAVATION AND STACKING OF SPOIL



ENSURE MATERIAL IS KEPT CLEAR OF TRENCH

It is advisable to deposit all loose excavated material (spoil) well clear of the excavation. Any loose or unstable soil in the trench or tools left around the excavation area are trip hazards and could also fall on workers inside a trench. In the event of an emergency, materials left at the bottom of a trench could impede your evacuation progress.

KEEP MATERIAL AWAY FROM THE EDGE OF THE TRENCH

It is advisable to deposit all excavated material (spoil) well clear of the excavation. It is recommended that the spoil is kept out of the angle of 45 degrees from the trench. This means that whatever the depth of the trench is, the spoil should be a minimum the same distance away from the edge of the excavation. It is preferable to remove soil to a suitable location.

GROUND CONDITIONS

In their natural condition, soils have varying degrees of cohesive strength and frictional resistance. Cohesive strength is the property of soil that allows it to stick to itself and remain stuck together. Examples of materials with virtually no cohesive strength are dry sand, saturated sand and gravels with minimum clay content. Ground encountered in excavations can generally be categorized as one of three types:

- Hard, compact soil
- Soil liable to crack or crumble, and
- Loose or running material

The stability of any excavated face depends on the strength of the soil in the face being greater at all times than the stresses it is subjected to. The following situations increase soil stresses in an excavated face and may lead to failure in bad weather, with additional load or due to vibration:

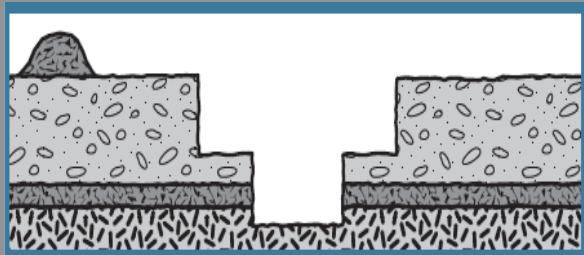
- Deep cuts and steep slopes, by removal of the natural side support of the excavated material
- Loads on the ground surface near the top of the face, such as excavated material, digging equipment or other construction plant and material
- Shock and vibration, which could be caused by pile-driving, blasting, passing loads or vibration producing plant
- Water pressure from ground water flow, which fills cracks in the soil, increases horizontal stresses and the possibility of undermining, and
- Saturation of soil, which increases the weight and in some cases the volume of the soil.

BENCHING & BATTERING

Benching and battering the excavation walls is one of the simplest ways to control the risk of trench collapse.

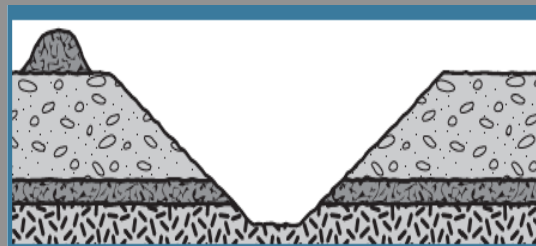
BENCHING

Benching is the creation of a series of steps in the vertical wall of an excavation to reduce the wall height and ensure stability. Benching is a method of preventing collapse by excavating the sides of an excavation to form one or more horizontal levels or steps with vertical surfaces between levels.



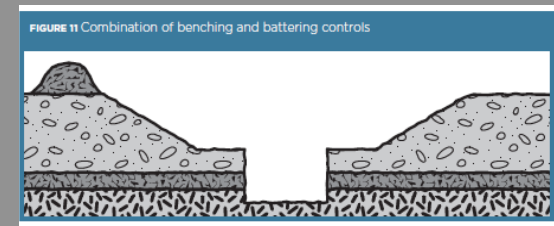
BATTERING

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



BENCHING & BATTERING

Benching and battering of excavation walls can minimise the risk of soil or rock slipping into the excavation. Control measures should be designed by a competent person (for example 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.



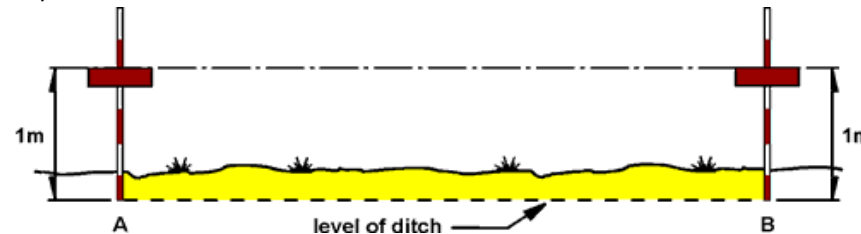
THE PROFILE BOARD METHOD

The profile board method is a simple method which can be used on most small manual excavation projects to ensure that the bottom of trenches are level. The steps are outlined below:

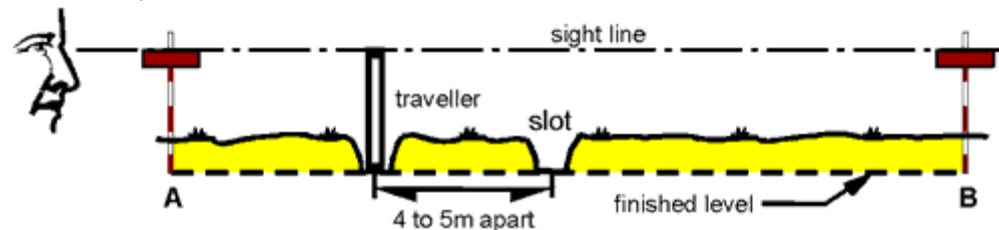
Excavation of a ditch is shown from point A to point B at the level of the dotted line (see figure below)



To ensure a correct and uniform level of the ditch, profile boards are placed at positions A and B, with the level boards 1 metre above the level of the excavated ditch (see figure below)



To ensure a correct and uniform level of the ditch, profile boards are placed at positions A and B, with the level boards 1 metre above the level of the excavated ditch (see figure below)



THE PROFILE BOARD METHOD

(Continued)

- By placing the traveller in the sight line between A and B, it is easy to determine whether the excavation has been carried out to correct levels.
- If the top of the traveller is below the sight line between the two fixed profile boards, the ditch has been excavated to a too low level. If the traveller sticks up above the sight line the ditch needs to be dug deeper.
- Dig slots at regular intervals of 4 to 5 metres along the sight line and join up to create the excavated ditch.
- Control the level of each profile board by using a line level.

MANAGING HEALTH AND SAFETY ASSOCIATED WITH EXCAVATION

A person conducting a business or undertaking must manage risks to health and safety associated with excavation work

HAZARDS AND RISKS

- A person falling into an excavation;
- A person being trapped by the collapse of an excavation;
- A person working in an excavation being struck by a falling object;
- A person working in an excavation being exposed to an airborne contaminant.

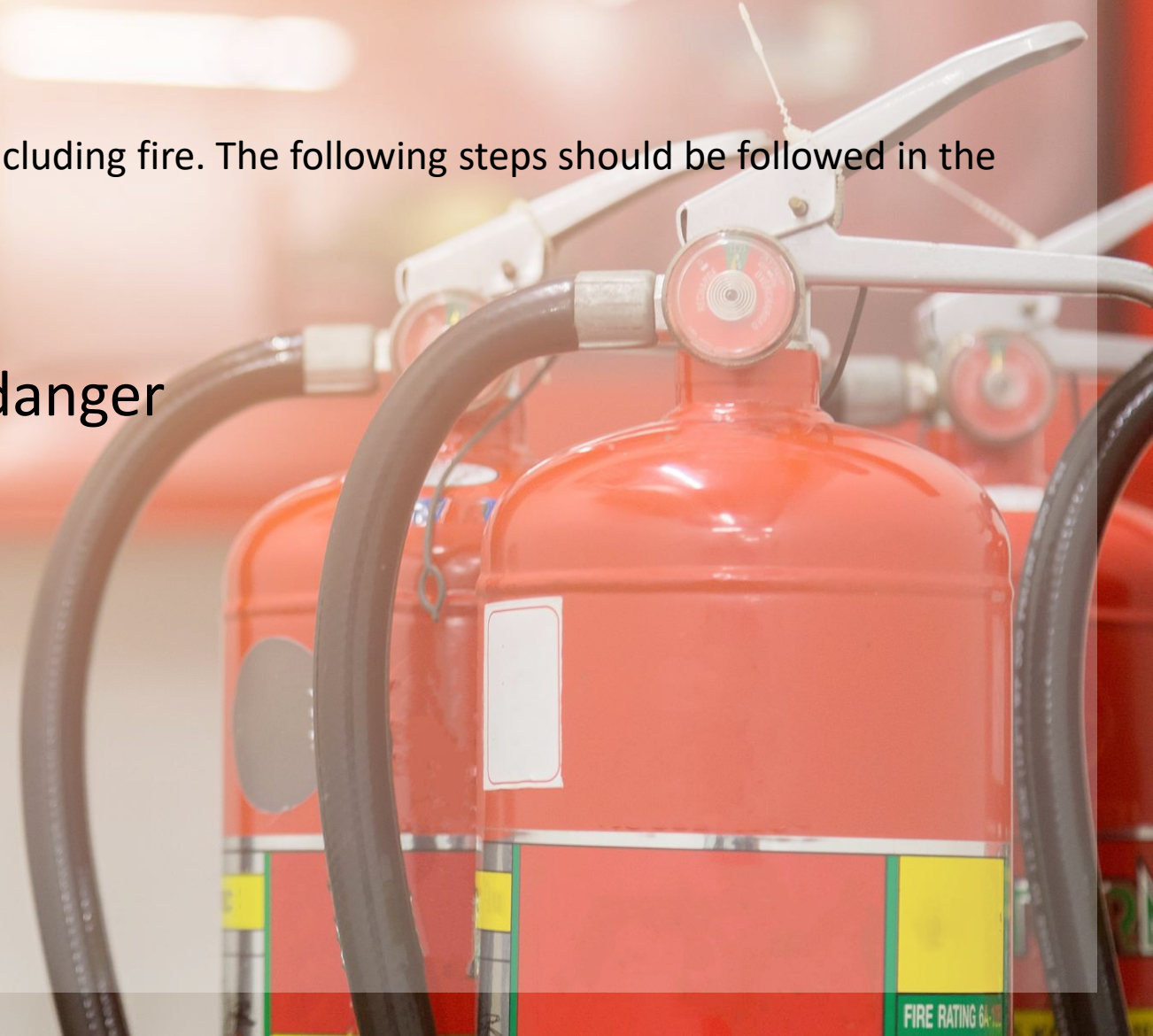
CONTROLS

- A person with management or control of a workplace where excavation work is carried out must erect a barricade or hoarding at least 900mm high to restrict access by persons to the excavation.
- Use appropriate signage
- Keep equipment away from the edge of trenches
- Inspect and test soil conditions before starting excavation
- Use sloping, benching and shoring as required

FIRE EMERGENCY

Workers must be trained for an emergency procedure including fire. The following steps should be followed in the event of a fire emergency;

1. Remove people from immediate danger
2. Confine fire and smoke
3. Alert people of emergency
4. Evacuate to the assembly area



MEDICAL EMERGENCY

The DRSABCD action plan is a valuable aid in assessing if a person has life-threatening conditions in an emergency situation.



01

DANGER

Ensure the area is safe for yourself, others and the patient.

02

RESPONSE

Check for response—ask name, squeeze shoulders

No response - Send for help.

Response - make comfortable, check for injuries, monitor response.

03

SEND for help

Call Triple Zero (000) for an ambulance or ask another person to make the call.

04

AIRWAY

- Open mouth - if foreign material is present:
- Place in the recovery position
- Clear airway with fingers.
- Open airway by tilting head with chin lift.

05

BREATHING

Check for breathing- look, listen and feel.

Not normal breathing

- Start CPR

Normal breathing

- Place in recovery position
- Monitor breathing
- Manage injuries
- Treat for shock

06

CPR

Start CPR- 30 chest compressions: 2 breaths

Continue CPR until help arrives or patient recovers.

07

DEFIBRILLATION

Apply defibrillator if available and follow voice prompts.

CLEANING WORK AREA

Clear work area and dispose of or recycle materials in accordance with project environmental management plan.

Cleaning up correctly is just as important as any other task involved in construction. Cleaning up means all debris and waste materials must be collected and removed to the waste storage area and sorted for recycling. Unused materials must be cleaned and returned to the storage area and stacked or stored neatly. Report faults in a logbook or site records. The work area must be left clean, safe and secure on completion of the task.



The construction process has particular environmental impacts and mitigation options at each level of work: site establishment and setup; construction work activities; and, site restoration after the completion of work. To guard against these environmental impacts ensure that the Environmental Management Plan is adhered to when clean-up activities are undertaken.