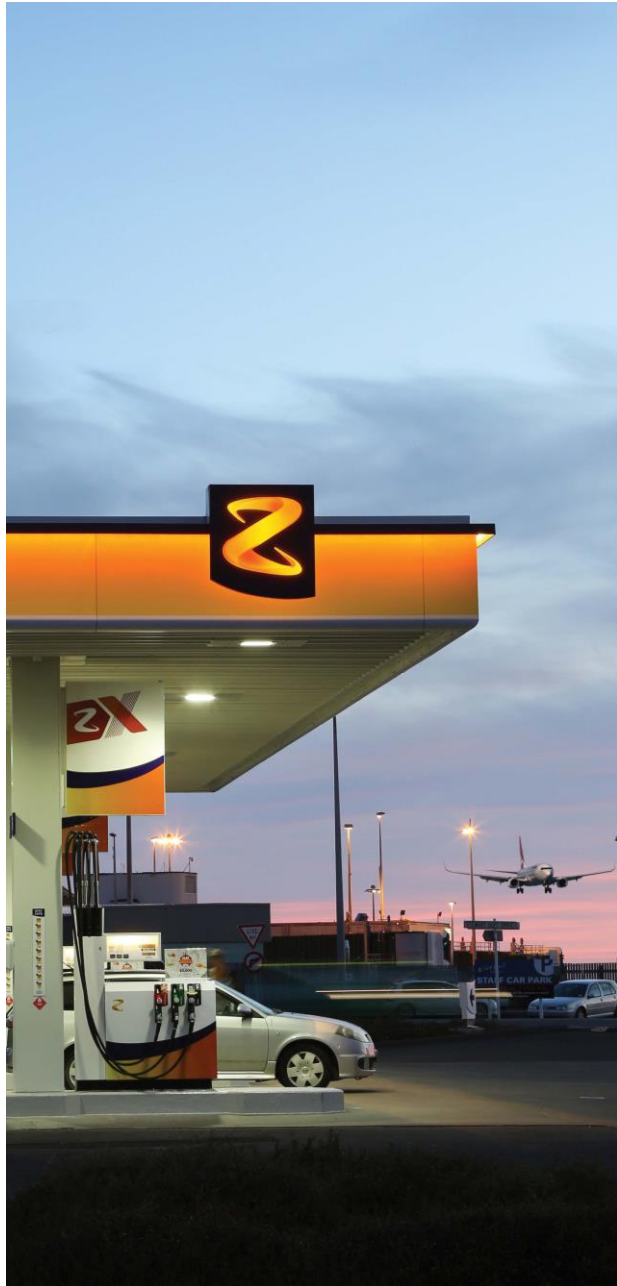


Excavation

HS-IOA-GUI-011



Revision Summary

Version	Author	Reasons for Change	Approver	Date Approved
1.0	M Imamura	New document	M Guantero	3 Sep 2018
1.1	M Imamura	Permit requirement for high risk excavation works only	M Guantero	18 Jan 2019



1: Purpose and scope

This document sets the requirements for performing excavations for and on behalf of Z Energy Limited (Z). It also sets out requirements for work where there is a potential risk of falling or where excavation site is classified as a confined space.

Definition of Excavation

For purposes of this document, "Excavation" is defined as work involving the removal of soil or rock from a site to form an open face, hole or cavity, using tools, machinery or explosives.

It includes:

- open excavations
- potholing
- pit excavations
- trenches and retaining walls
- shafts and drives

This excludes gardening and soil sampling by hand tools.

Applicability

This document applies to all persons working for and on behalf of Z or its subsidiaries, i.e. employees, contractors, sub-contractors, franchisees, and retail site staff, as well as visitors and other third parties on premises operated by Z or its subsidiaries.

Compliance shall be the responsibility of all employee, contractor, retailer and retail site staff or 3rd party working for or on a Z area of business. This is a Z procedure and adherence to the procedure is not required in any area controlled exclusively by another third party.

All work involving excavations must comply with the requirements of the Health and Safety at Work Act 2015 (HSWA) and all relevant regulations, including the Health and Safety in Employment Regulations 1995 (the HSE Regulations) and the Health and Safety at Work (General Risk and Workplace Management) Regulations 2016 (the GRWM Regulations). This procedure takes precedence only where its requirements exceed those of applicable laws and regulatory requirements.

All applicable laws and regulations shall be complied with when performing any work, either within or beyond the scope of this policy.

2: Hazards



People at height



Object at height



Mechanical equipment



Structural stability



Restricted space

Applicable LifeSavers

<p>Comply with safety document requirements Always get an approved permit before work starts</p>	<p>Restrict confined space entry Only enter a confined space with authorisation</p>	<p>Work in clear air Check for gas when working in hazardous zones and keep all ignition sources out</p>
<p>Prevent all falls Use barriers or fall restraints when working at heights greater than 1.8 metres</p>	<p>Stay clear of elevated loads Never walk or work under an elevated load</p>	<p>Be clear headed and alert Never let alcohol, drugs or other factors impact your ability to work safely and effectively</p>



3: References

External References

- Health and Safety at Work Act 2015
- [Health and Safety at Work \(General Risk and Workplace Management\) Regulations 2016 \(HSWA GRWM Regulations\)](#)
- WorkSafe's Good Practice Guidelines for Excavation Safety (<https://worksafe.govt.nz/topic-and-industry/excavation/excavation-safety-gpg/>)
- NZ Guide for Safety with Underground Services (<https://worksafe.govt.nz/dmsdocument/1442-guide-for-safety-with-underground-services>)
- New Zealand Electrical Code of Practice for Electrical Safe Distances (NZECP 34:2001) <https://worksafe.govt.nz/dmsdocument/1565-new-zealand-electrical-code-of-practice-for-electrical-safe-distances-nzecp-34-2001>

ZORM Documents

- Z's Approach to managing operational risks
- Z's Approach to managing operational integrity
- Z's Permit to Work Manual
- Z's Drug and Alcohol Policy
- Managing fatigue at Z - QRG
- PPE Matrix - QRG
- PPE Specifications - QRG

4: Roles and responsibilities

Senior Permit Issuer	<ul style="list-style-type: none"> • Ensure any tasks that involves excavation is managed under the Z Permit to Work System (PTW)
Permit Issuer	<ul style="list-style-type: none"> • Confirm that the hazards associated with excavations have been identified and assessed and that the identified controls are adequate to perform the work in a safe and environmentally-sound manner prior to authorising and issuing the Permit to Work
Permit Holder	<ul style="list-style-type: none"> • Completes a Safe Work Method Statement (SWMS)/Hazard Identification and Task Risk Assessment (HITRA) that reflects the Hierarchy of Control before excavation commences • Ensure only a competent person performs excavation works • Ensure all equipment used comply with relevant code of practice or regulation, be fit for purpose, well maintained and certified where required
Competent person conducting excavations	<ul style="list-style-type: none"> • Use only equipment that is in good condition and meets the minimum requirements set out in this document and WorkSafe's Good Practice Guidelines for Excavation Safety • Trained and competent in the use of excavation machinery (refer to section 5.5 for Competency requirements)
Standby person	<ul style="list-style-type: none"> • Know the hazards of excavation • Ensure the conditions and requirements listed in the permit are adhered to • Be familiar with Rescue Plan requirements, and activate plan without hesitation should the need arise • Get help if an emergency develops, using the site emergency telephone number (where this exists), radio, or other pre-planned means
Spotter (when using heavy machinery)	<ul style="list-style-type: none"> • Direct excavator operation and any pedestrian movements • Ensure machinery operator understands the signals they will use and agree on the way to communicate with each other



5: Requirements

All Excavations shall be managed under the **Z Permit to Work System** (PTW).

Work permit is required for high-risk excavation works.

An **Excavation Certificate** must be used in conjunction with the permit to provide a higher level of detail on the controls to be put in place to manage the activity. Prior to requesting a permit for an excavation, the Supervisor or Permit Holder responsible for the work shall initiate the completion of an Excavation certificate. This entails a check of all relevant drawings for the location of any known underground cables, piping, or equipment. The drawings inspected and the details of any equipment located, shall be recorded on the form.

Should a hazard be located, the need to proceed with the excavation in that location should be re-appraised.

Where other hazards are involved, additional controls will be required.

Work condition	Additional controls
Excavation in hazardous zone	LOTO certificate, Hot Work certificate
Excavation requiring man entry	Confined space certificate
Risk of fall of 1.8 meters or more	Working at height certificate
Work involving tank removal/installation	Tank removal/installation certificate
Work involving demolition	Demolition certificate
Working on a road	Traffic management plan

Hot Work in Excavations

Trenches/Excavations have the possibility of holding flammable vapours that are heavier than air, either from migration from adjacent areas, previous work activities such as breaking into or draining of a containment system, or possible residual product in the ground. Therefore, Hot Work activities within trenches/excavations require Pre-Work Testing, and Continuous Monitoring. Refer to SWP-Hot work.

Excavations as a confined space

Trenches/Excavations have the possibility of holding flammable vapours, and toxic's – i.e. Hydrogen Sulphide, and Carbon Monoxide that can displace Oxygen. These gases come from a variety of sources either from migration from adjacent areas, or possible residual product in the ground. Therefore, activities within trenches or excavations, which require entry, require Pre-Work Testing, and Continuous Monitoring.

Where an excavation is considered to be a Confined Space, then the guidelines applicable to working in a confined space shall be followed. When entry into an excavation is required, Confined Space procedures need to be applied – this will include pre-entry, continuous atmospheric testing, and provision for rescue plan including retrieval methods for conceivable events.

Excavation near overhead electric supports

The New Zealand Electrical Code of Practice for Electrical Safe Distances (NZECP 34:2001) requires that prior written consent of the pole owner shall be obtained for any excavation or other interference with the land near any pole or stay wire of an overhead electric line where the work:

- (a) is at a greater depth than 300mm within 2.2 m of the pole or stay wire of the line; or
- (b) is at a greater depth than 750 mm between 2.2 m and 5 m of the pole or stay wire; or
- (c) creates an unstable batter.

This requirement does not apply to vertical holes, not exceeding 500 mm diameter, beyond 1.5 m from a pole or stay wire.

Prior written consent of the tower owner shall be obtained for any excavation or other interference with the land near any tower supporting an overhead electric line where the work:

- (a) is at a greater depth than 300 mm within 6 m of the outer edge of the visible foundation of the tower; or
- (b) is at a greater depth than 3 m between 6 m and 12 m of the outer edge of the visible foundation of the tower; or
- (c) creates an unstable batter.



5.1 Hierarchy of controls

At all times, when carrying out excavations make a risk assessment and apply the “Hierarchy of Controls”, in descending order.

Hazard	1. Eliminate	2. Isolate	3. Minimise
Falls and falling objects		<ul style="list-style-type: none"> Use of work platforms, edge protection, guard rails. Refer to section 5.3.3 Preventing people and materials falling in 	<ul style="list-style-type: none"> Safe access and egress (including alternative access and egress points for emergency use). Refer to section 5.3.1 <i>Safe access and egress</i> Catch platform Covers over excavation during non-work times Clearly defined pedestrian detours Signage PPE: hard hat Emergency and rescue plan
Ground instability/collapse		<ul style="list-style-type: none"> Shoring, benching, battering. Refer to section 5.3.2 <i>Preventing collapse</i> Store spoil away from the excavation's zone of influence plus 1 m. Physical barrier such as wheel stoppers to restrict mobile plant movement near an excavation 	<ul style="list-style-type: none"> Geotechnical site assessment Provide processes for dewatering. Refer to 5.3.4 <i>Control of Water</i> Regular site inspection. Refer to section 5.2.1 <i>Factors to consider in planning the job</i>
Hazardous atmosphere	<ul style="list-style-type: none"> Do not use plant with a combustion engine (eg air compressors, electrical generators) in an excavation if workers may potentially enter to work 		<ul style="list-style-type: none"> Gas monitoring Install mechanical ventilation Use of respirators
Confined space entry		<ul style="list-style-type: none"> Refer to Safe Work Practices for Confined Space Entry 	<ul style="list-style-type: none"> Gas monitoring Install mechanical ventilation
Manual handling tasks	<ul style="list-style-type: none"> Use of lifting devices (hiabs, cranes, trolleys) 		<ul style="list-style-type: none"> Manual handling training Rotate tasks and make sure workers take breaks
Overhead services		<ul style="list-style-type: none"> Apply minimum approach distances for mobile plant and work activity from overhead lines. Apply minimum approach distances for excavation and earthworks from towers and support structures Refer to <i>Table 1. MADs to excavate with mobile plant</i> 	<ul style="list-style-type: none"> Signage about the minimum approach distance Earthing of mobile plant Use of Spotter Emergency response plan Consents and permits Refer to 5.2.3 <i>Overhead clearance</i>
Underground services			<ul style="list-style-type: none"> Underground survey Trace and mark out services – detecting and marking actual layout Use fit-for-purpose locating devices Refer to section 5.2.2 <i>Underground services</i> Consents and permits PPE: ear muffs/plugs
Vibration and hazardous noise		<ul style="list-style-type: none"> Provide exclusion zones 	<ul style="list-style-type: none"> PPE: ear muffs/plugs
Moving machinery		<ul style="list-style-type: none"> Barriers to separate pedestrians and mobile plant. 	<ul style="list-style-type: none"> Traffic management plan Use one or more spotters to spot obstacles or any signs of services in the excavation. Refer to section 5.3.6 <i>Use of heavy equipment</i> PPE: high visibility vests



5.2 Site preparations

Before commencing work Supervisors, Engineers, Contractors and constructing authorities should obtain as much information as possible about the ground conditions of a work site – including but not limited to;

- Checking the contaminated land register and seek pre-approval for soil disposal
- "Dial Before U Dig"
- Council consent required

5.2.1 Factors to Consider in Planning the Job

When deciding upon a system of excavation support, the Supervisor in charge of an excavation should consider the following factors:

1. Nature of the ground
 - soil or rock type
 - moisture content of the rock or soil - is it wet or dry? If dry, will its cohesive characteristics deteriorate when it becomes wet? If wet, will water control be required?
 - water table level
 - faults and bedding planes
 - whether an excavation will create a Confined Space condition in accordance with Notifiable Works requirements and/or AS/NZS 2865:2009 definitions.
2. Possibility of flooding from any water source
 - stormwater drain
 - surface run-off after heavy rain
 - swamp, dam, reservoir, lake, or river
3. Hazards, natural or artificial
 - intersecting old service excavations
 - telephone and electricity supply poles
 - manholes and other shafts
 - ground contamination (including hydrocarbons/lead)
 - vapours
 - bends in an excavation
 - leaking services corners created by the joining of pipe systems, i.e. "T", "Y", or "+" junctions
 - trees
 - the threat to health and safety from the past dumping of chemicals

5.2.2 Underground services

- Where hazards are known to exist, their location and exposure shall be excavation by non-destructive means.

Potential underground hazards that may be encountered and hence should be checked for include:

- Product pipelines
 - Electricity cables
 - Drains
 - Instrument cables
 - Gas pipelines
 - Water pipelines
 - Fire service and foam lines
 - Air services
 - Steam services
 - Hot Oil Lines
 - Telephone and communication cables
 - Fire Alarm cables
 - Anodes and anode cables
- Use detectors to locate services laterally as excavation depth progresses, before working towards and exposing the services
 - After a thorough review of underground services, and before any digging shall commence, a thorough site inspection shall be performed. The purpose of the site inspection is to identify any other potential hazards that exist, but which may not be detailed on the drawing[s]. Underground service markers should be physically identified to verify their actual position correlates to the location indicated on the drawings.
 - Dig in line with the service, not at right angles



- Any plant or excavation activity (including using hand-held tools) closer than the minimum approach distances (MADs) summarised in Table 1 requires a documented permit or consent from the service owner. This should be held on site. Always check with the service owner, as they may have their own specific requirements for work on their service.

Table 1. MADs to excavate with mobile plant (from WorkSafe Guide on Excavation Safety)

Service	Distance away
Cables, gas transmission or high pressure pipelines	2 m or more
Overhead power line	4 m or more
Pole or support stay	5 m or more
Tower	12 m or more

- Should any unsuspected hazard be encountered during excavation, work should cease until the nature of the hazard is determined and the Permit Issuer has authorised work to recommence.

General safety

- Never assume you know exactly where an underground service is located.
- Follow the WorkSafe NZ 'Guide for Safety with Underground Services' and 'WorkSafe's Good Practice Guidelines for Excavation Safety'.
- Be aware of pipeline appurtenances, not necessarily identified on drawings, such as redundant pipeline tees, flanges or cathodic protection cables.

5.2.3 Overhead clearance

Inspection of overhead hazards (e.g. canopies, powerlines, trees, signs) must be conducted to ensure there is sufficient overhead clearance for the excavating equipment.

When excavating near overhead service support structures, the MAD as summarised in Table 1 must be complied with. If the service owner consents to excavating closer than the 4 m MAD, controls must be in place to:

- Protect operators (including operators of remote controlled plant) from electrical hazards.
- Keep people away from the mobile plant in case of electrical contact.
- Have emergency response procedures in place, if electrical contact does accidentally happen.

5.2.4 Nearby building or structures

A competent person should assess any excavation near or below the footing of any structure, including retaining walls. He should determine if any supports to brace the structure are required to prevent any structural failure or ground collapse.

5.2.5 Contaminated soils and groundwater

Before starting any excavation work, assess the likelihood of encountering contaminated soils or groundwater. If contamination is suspected or discovered, the risk to human health and the environment will require reassessment. [Health and Safety at Work \(General Risk and Workplace Management\) Regulations 2016 \(HSWA GRWM Regulations\)](#) continue to apply when dealing with contaminated soil or when workers are on a contaminated site or handling soil contaminated with hazardous substances. This includes during the remediation, excavation, testing and monitoring of the soil.

A land use consent may also be required from the local authority to excavate or disturb soils at the site.

5.3 Excavation work

5.3.1 Safe access and egress

- Provide safe access and egress into excavation. Stairways, ladders, or ramps shall be located in excavations so that no one is more than 7m from a point of exit. Ladders must extend a minimum of 1m above the top of the excavation.

NOTE: For excavation up to 1.5 m deep, ladder, stairway, or ramp can be used for access and egress. For excavation 1.5 m or more deep, ladder or stairway can be used for access and egress

- There should more than one means of egress for larger excavation.
- Where workers or equipment may cross over excavations, walkways or bridges shall be equipped with standard guardrails and toe boards.
- Workers shall not be permitted to work on the faces of sloped or benched excavations at levels above other workers.



5.3.2 Preventing collapse

- Shore, bench, or batter back. Do not assume ground will stand unsupported. See figure 1-3 below for examples. For details, refer to WorkSafe's Good Practice Guidelines for Excavation Safety (<https://worksafe.govt.nz/topic-and-industry/excavation/excavation-safety-gpg/>).

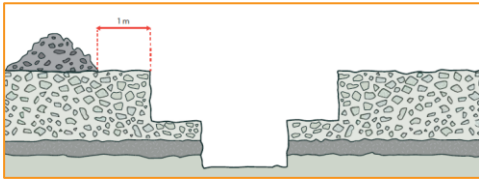


Figure 1. Benching



Figure 2. Battering

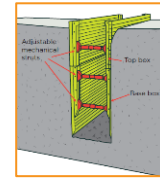


Figure 3. Shoring

- HSE Regulation 24 requires any excavated face more than 1.5 m high to be shored, so far as is reasonably practicable, unless:
 - the face is cut back to a safe slope, or
 - the material in the face is of proven good standing quality under all reasonably foreseeable conditions of work and weather, or
 - by reason of the nature of the work and the position of any worker in the vicinity, there is no danger to any worker, or

shoring is impracticable or unreasonable and other precautions have been taken to make the face as safe as possible in the circumstances.

Placing the Spoil Pile

- Store spoil away from the excavation's zone of influence plus 1 m. See Figure 4 below.

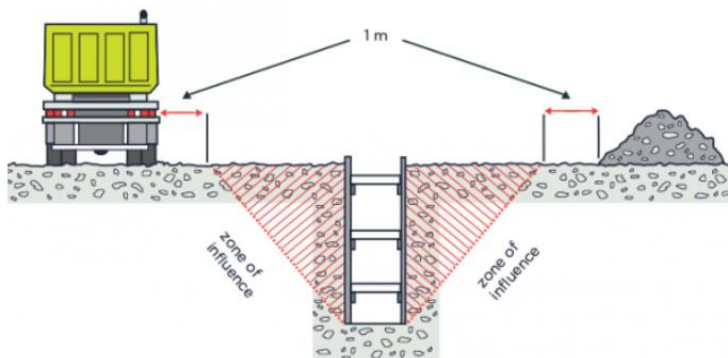


Figure 4. Spoil pile from zone of influence

- If spoil is placed close to an excavation due to obstructions like fences, buildings, or trees, the weight of the spoil may overload the excavated faces. In this case, strengthen the ground support system at these locations and provide barriers to prevent the material falling into the excavation.
- If excavating beside an old service line, place spoil on the opposite side of it to prevent excessive loading on previously weakened ground.
- If excavating in sloping ground, place the spoil on the lower side of the excavation to reduce the risk of spoil falling into the excavation. See Figure 5.

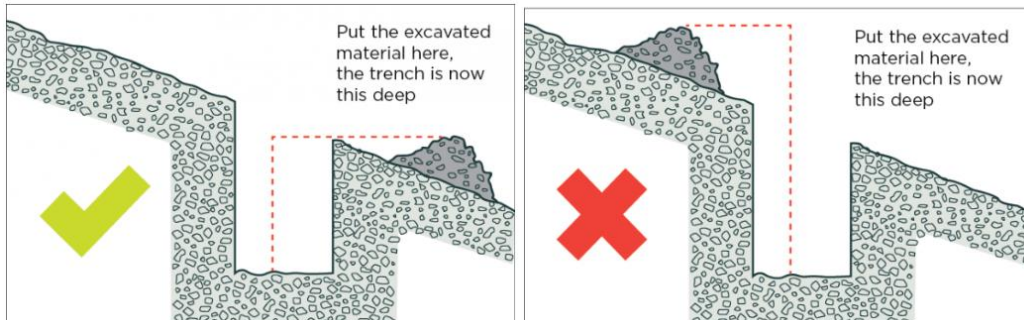


Figure 5. Spoil pile on sloping ground



5.3.3 Preventing people and materials falling in

- Where there is a risk of workers falling more than 2 metres into an excavation, suitable barriers need to be in place to prevent such a fall. Barriers must be in place 2 metres from the excavation edge. Refer to Z Safe Work Practices- Working at Heights. If this is not practical, then alternatives such as temporary work platform or fall arrest systems (e.g. catch platforms) must be in place.
- Unattended excavations must be physically barricaded to prevent accidental entry into the area.
- Excavations must be backfilled as soon as reasonably practical.

5.3.4 Control of Water

- If evidence of possible cave-ins or slides are found, all work in and around the excavation must stop until precautions have been taken to safeguard those who must work in the excavated areas.
- Diversion ditches, dykes, or other suitable means shall be used to prevent surface water from entering an excavation and to provide adequate drainage to the area adjacent to the excavations.

5.3.5 Use of plant and equipment

- Make sure the plant and equipment are fit-for-purpose and in good working order.
- Carry out daily pre-start checks on the general condition and maintenance of the equipment
- Regular inspections by a competent person must be carried out, in accordance with the manufacturer/supplier's specifications or relevant standards.

5.3.6 Use of heavy equipment

- A pre-start equipment check of the excavator shall be conducted and documented by the excavation contractor prior to commencement of each day's work. This should include operational check of all critical safety devices, such as emergency stop buttons (if present).
- When excavation equipment, cranes, trucks or other heavy objects are operated within a distance from the edge of the excavation, equal to the depth of the cut, the exposed side must be sheet piled or shored and braced adequately to resist extra loading of such equipment. Such support system must satisfy the requirements as per [WorkSafe's Good Practice Guidelines for Excavation Safety](#).
- No person shall be permitted under loads.
- A Spotter will be required where there is heavy equipment manoeuvring near excavation. Spotter must be in a safe position to direct excavator operation and any pedestrian movements. Spotter and operator must ensure that they understand and agree on the signals or ways they will use to communicate with each other.
- Provide an exclusion zone around the heavy equipment in use. See Figure 6.

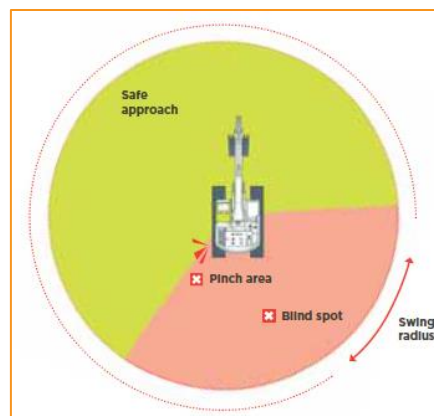


Figure 6. Safe approach zone for an excavator

- Before entering the exclusion zone, ensure acknowledgement from equipment operator.



5.4 Competency

A competent person who has acquired through training, qualification or experience the knowledge and skills to carry out the excavation should assess and manage the risks relevant to the excavation's depth. WorkSafe's Guide on Excavation Safety set out some recommended competencies depending on the work conditions. See Table 2.

Table 2 – Training and competency requirements for excavation work (normal condition*)

Role	Competency
Excavation work designer/supervisor working on <ul style="list-style-type: none"> Up to 1.5m Shored, benched and/or battered 	Recent experience in carrying out or supervising excavation work
Excavation work designer/supervisor working on <ul style="list-style-type: none"> 1.5 m - 3 m Flat, open ground Shored, benched and/or battered 	Recent experience in carrying out or supervising excavation work at these depths Technical or trade qualification (eg as a civil engineer or drain layer)
Excavation work designer/supervisor working on <ul style="list-style-type: none"> 3 m - 6 m Flat, open ground Shored, benched and/or battered 	Technical or trade qualification (eg as a civil engineer or drain layer) Recent experience in carrying out or supervising excavation work in similar ground at these depths Experienced and able to interpret the site's soil information
Excavator operator	Trained and competent to use the excavator
Workers on excavations with depth >1.8 metres	Have achieved competence on NZQA Unit Standard 17600– Explain safe work practices for working at heights
Workers who are required to work using a safety harness	Have achieved competence on NZQA Unit Standard 23229– Use a safety harness for personal fall prevention when working at height, or an equivalent or higher qualification.
Workers who will enter the excavation that is also classified as a confined space	Have achieved competence on NZQA US required for Confined Space Entrant (see SWP on Confined Space Entry)
Spotter	Familiar with the hazards associated with the machinery and excavation work.

**Normal condition: Generally flat open ground. Groundwater can be controlled with simple methods, such as a sump pump arrangement. Additional competencies required for complex condition which may include very weak or sensitive soils, groundwater that require specialist dewatering or locations near structures and sensitive infrastructure.*

5.5 Fitness for work

- A competent person must be physically fit for the task, must have the ability to identify hazardous conditions, and must take action to maintain a safe workplace.
- If workers are exposed to extreme temperatures or physical demands, refer to **Managing Fatigue at Z guidelines** to address the risks of fatigue (HS-HAW-H-GUI-001).
- Workers must comply with **Z's Drug and Alcohol policy**. Z requires the performance of its staff, contractors and others on Z premises or operating equipment on Z's behalf to be unimpaired by alcohol or drugs.



5.6 WorkSafe notifiable work (related to excavations)

The Health and Safety in Employment Regulations 1995 require employers as well as the person who controls a place of work to provide at least 24 hours notice to WorkSafe of particularly hazardous work as defined below:

- Use of a lifting appliance where the appliance has to lift a mass of 500 kilograms or more a vertical distance of 5 metres or more. Excludes:
 - work using an excavator,
 - work a fork-lift, or
 - work using a self-propelled mobile crane
- Work in any pit, shaft, trench, or other excavation in which any person is required to work in a space more than 1.5 metres deep and having a depth greater than the horizontal width at the top.
- Work in any drive, excavation, or heading in which any person is required to work with a ground cover overhead.
- Work involving the use of explosives, or storage of explosives for use.
- Work that in which a person breathes compressed air, or respiratory medium other than air

For a more detailed guideline for managing health and safety risks associated with excavation work, refer to [WorkSafe's Good Practice Guidelines for Excavation Safety](#).

