RYMAN HEALTHCARE

EXCAVATIONS

SAFELY CONTROLLING WORK
CRITICAL RISK CONTROL DOCUMENT

We are always licenced and competent when operating plant

We always isolate all energy sources before working on equipment and systems

We come to work free from impairment, alcohol and drugs

We ensure plant and equipment is safe to use

We work safely at height

We store, handle and control hazardous substances safely

We always observe walkways, safe zones and exclusion zones

We always make sure loads are secure and within safe working load limits before moving them

We always follow the Permit process when a Permit is required

Our temporary works are appropriately designed, engineered and installed

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DOCUMENT CONTROL			
Document Name	Excavations		
Issue Date	01-June-2022		
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DOCUMENT REVIEW			
Date	Revision	Description of Change	Author
1-Dec-2021	1	First document	AE, MJ, OG
1-Jun-2022	2	• Included page numbers • Added additional risks (e.g. dust etc..) • Added a sentence clarifying Permit to break ground does not include activities that does not break ground (e.g. using a spade to remove rain water etc) • Adjusted a sentence that for task planning review factors such as soil stability, soil type, contamination and water table level. The Geotechnical report that was prepared during resource consent (or others) must be available on-site for reference as required. Additional Geotechnical report may be required if ground conditions change or mobile plant are used	AE, MJ, OG, AVR, JB

Excavations

Excavation work generally means work involving the removal of soil or rock from a site to form an open face, hole or cavity, using tools, plant and machinery.

Activities on our construction sites that involve excavations include:

- Trenching
- Open excavations
- Potholing
- Pit excavations
- Trenches and retaining walls
- Shafts and drives
- Services placement and setup
- Piling works

Related extreme and high-risk work documents:

- Mobile Plant
- Work at Height, Dropped Objects and Temporary Work Platforms
- Scaffold and Mobile Scaffold
- Cranes, Hoists and Other Lifting Activities
- Underground and overhead services

Risks - What could go wrong?

- Trench/excavation collapse/cave in from ground instability, soil disturbance, water accumulation, erosion or earthquake causing fatality/s through crushing or asphyxiation or a potentially major injury such as dislocation, crushing, strains/sprains, bruising/lacerations, fractures or serious head injuries
- Striking underground services (e.g. power lines, cables, gas pipes) causing fatality or major injury such as electrocution, electric shock, burns of fatality from fire/explosion or property damage (see 'Underground and overhead services' if these services are present near your excavation)
- Collapse of surrounding structures due to compromised integrity of structures such as scaffold or buildings around the excavation
- Mobile plant striking people, other plant or structures causing a fatality or a major injury such as crushing, dislocation, fractures or serious head injuries
- Mobile plant crushing with other mobile plant, loads, structures causing fatality or injury such as major injury such as dislocation, crushing, strains/sprains, bruising/lacerations, fractures or serious head injuries
- Fumes or noise causing a potential health injury (e.g. kidney damage, carcinogens, Noise Induced Hearing Loss, etc..)
- Fall from height (e.g. from inadequate access/egress) causing a fatality or a potentially major injury such as dislocation, crushing, strains/sprains, bruising/lacerations, fractures or serious head injuries (see 'Work at Height, dropped objects and temporary work platforms' if your work involves height)
- Dropped objects into excavation causing injury to others (see 'Work at Height, dropped objects and temporary work platforms' if your work poses a risk of dropped objects)
- Exposure to dust, asbestos or contaminated soil causing asbestosis, or fatality or serious illness through infection or hazardous substance
- Manual handling injuries such as strains and sprains from lifting of materials or use of tools and equipment

- Electrocution/Electric shock from water accumulation and workers using electrical items causing fatality/s or a potentially major injury such as burns, muscle spasm, respiratory distress, seizure, cardiac arrythmia, nervous system damage or delayed organ damage

All excavations, no matter the depth, can be risky. Ground collapse can occur quickly and without warning, giving a person virtually no time to escape, especially if the collapse is extensive. A buried person is likely to die of suffocation before help arrives (either the head is buried, or the chest is so restricted by the ground's weight the person cannot breathe).

Controls – How do I keep safe?

The identification of risks associated with excavations and appropriate control measures are to be fully detailed in a Safe Work Method Statement (SWMS) or similar risk-assessment document prior to commencing any work involving excavations. A Permit to Break Ground must also be in place for all activities that break ground.

Can I eliminate the risk?
Wherever work can be completed without the need to excavate, this should be the first consideration in eliminating risk.

The SWMS must be reviewed by an appropriate Ryman representative prior to any work commencing and following any changes to the task or environment.

Excavations controls include but are not limited to:

	Control Type	Control Measure	Control Level
Minimization	**Elimination**	Remove risk by not requiring excavation activities (e.g. construct at ground level and infill)	Most Effective Control ↓ Least Effective Control
	Substitution	Substitute excavations for another method that present less risk (where applicable) e.g. horizontal drilling, hydro blasting or tunneling methods	
	Isolation	Where there is a risk of falling from height into the excavation isolate the excavation to control unauthorized personnel or plant access the working area and collision with other plant. Isolate with fencing where practicable, the trench shoring/shields themselves, or cones, barriers, tapes, bunting etc. Isolate (or demarcate) excavation 'zone of influence' a minimum of 1m from excavation to help prevent mobile plant or material/spoil comprising the excavation Isolate any adjacent underground services before starting to dig i.e. lock out tag out	

Control Type	Control Measure	Control Level
↑ WORK ABOVE THE LINE WHERE POSSIBLE TO CONTROL RISK ↑		Most Effective Control
Engineering	Use benching and battering techniques to prevent trench collapse Shore or use trench shields on excavations over 1.5m deep or as determined by an engineer's soil analysis report Use a hydro vacuum technique e.g. hydro trenching or potholing Ladders and access ways in place where workers are required to enter excavation Use detection equipment to locate underground services	
Administrative	Permit to break ground (required for all activities that break ground). Hand dig (with hand tools) within 2.0 meters of the marked depth of any underground service Emergency rescue plan in place in case of trench collapse or service strike	
PPE	This includes the use of mandatory PPE including hard hat (AS/NZS 1801:1997), high visibility vest (to include day/night glow strips) (AS/NZS 4602.1) and safety footwear (AS/NZS 2210.3:2002)	Least Effective Control
NOTE: Where the risk cannot be eliminated, a combination of control measures may be appropriate.		

Before you start working in an excavation:
Before anyone enters an excavation, a competent person (See the following Training and Competency Section for information on 'a competent person'.) must assess the risks and figure out what you need to do to eliminate them.

Minimum Control Requirement

- For task planning review factors such as soil stability, soil type, contamination and water table level. The Geotechnical report that was prepared during resource consent (or others) must be available on-site for reference as required. Additional Geotechnical report may be required if ground conditions change or mobile plant are used
- Locate underground services (refer to 'Underground and Overhead Services')
- Comply with the heritage management (NZHPT) and Wildlife requirements. Report any findings to Heritage NZ / Ministry of Culture and Heritage or relevant entity as soon as possible as the finding may need to be preserved.

- Test if the ground has been contaminated by previous activity
- Check if the excavation could destabilize nearby structures or services
- Identify the right plant or equipment for the job. Refer to 'Mobile Plant' if your work involves mobile plant
- Confirm with Ryman Civil Representative that excavations planned is within site boundaries.
- Check weather forecast will not impact the safety of excavating or the stability of the excavation e.g flooding, ground collapse.

Considerations

- Consider the risk that vibration created by moving plant, adjacent roads, railway lines or other processes or activity may impact the integrity of the excavation

Some excavations may be classified as a Confined Space. Refer to **'**Confined Spaces'. A permit is required for confined space entry. Refer to 'Permit to Work Procedures' for information.

A confined space is:

- is an enclosed or partially enclosed space and
- is not intended or designed primarily for human occupancy and
- may present a risk from one or more of the following at any time:
  - unsafe concentration of harmful airborne contaminants
  - unsafe concentration of flammable substances
  - unsafe levels of oxygen
  - substances that can cause engulfment.

Examples include: storage tanks, tank cars, process vessels, boilers, silos, pits, pipes, sewers, shafts, ducts and shipboard spaces.

If underground services are identified or may be present refer to 'Underground and Overhead Services'.

Minimum Control Requirements for all excavations: (as per and in addition to Good Practice Guidelines for Excavation Safety)

- Permit to break ground must be in place for all excavation activities or other activities that break ground at any depth, including installation of waratahs (regardless of depth). Permit to break ground identifies the requirements for identifying underground services. See 'Permit to Work Procedures' for information. Permit to break ground does not include activities that does not break ground (e.g. using a spade to remove water after rain, etc..).
- Daily inspection of excavation to be completed for all excavation works in the Prestart.
- An Emergency Rescue Plan must be in place where there is a potential of an emergency arising from ground slips, gas leak or floods.
- Services running through the excavation/trench must be physically protected where they are at risk of mechanical damage (see 'Underground and Overhead Services')
- Water build up must be monitored and adequately controlled. This may require use of a water pump or in some cases stopping work. Monitor weather conditions as storms/heavy rains can contribute to water build up.

- Hand dig (with hand tools/ hand-held mechanical tools) or hydro excavate as per the close approach distances specified by asset owner. of the marked depth of any underground service
- Keep all spoil heaps, heavy vehicles, equipment, material, and plant away from the excavation edges
- The excavation must be checked each day before starting work and after any event that may affect its stability
- Edge protection/exclusion zones must be put in place where there is a risk of fall from height, for example barriers or bunting to isolate the excavation.
- Excavations with a depth less than 1.5m may still require control measures to prevent collapse dependent on several factors including soil type, surcharge, time left open, weather conditions etc, e.g. benching/battering, shoring, shields. Involve a competent person when you believe there could be a risk of ground collapse.

Minimum Control Requirements for Excavations 1.5 metres or deeper:

- These excavations must be planned and overseen by a competent person (see the next section 'Training and Competency')
- Isolate (or demarcate) excavation 'zone of influence' (ZOI) a minimum of 1m from excavation to help prevent mobile plant or material/spoil comprising the excavation
    - Spoil heaps positioned at least 1m from the ZOI of the excavation
    - Any mobile plant operations at least 1m from the edges of the excavation
- 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.
- Excavations deeper than 1.5m must be battered /benched/ shored as a minimum unless otherwise specified by a Geotechnical Engineer or other suitably competent person. Where this is not possible, the excavation must be inspected by a Geotechnical Engineer, certified safe in writing and regularly monitored
    - Benching and battering is the horizontal stepping or sloping of the face, side, or wall of an excavation, complying to the Good Practice Guidelines for Excavations
    - Shoring prevents collapse by maintaining positive pressure on the sides of the excavation, protecting workers
    - Shields do not ensure ground stability but protect workers from ground collapse, by preventing the collapsing material falling onto them
- Edge protection must be put in place where there is a risk of fall from height, for example barriers or bunting to isolate the excavation.
- When shields or a ground support system are not used to support an excavation in unstable ground conditions, the sides must be battered to the angle of repose of the spoil pile

- Where workers are required to enter an excavation over 1.5m the following must be in place:
    - safe access/egress must be provided
    - shoring/battering/benching/sheet piling to prevent collapse, as much as reasonable and practicable and complying to the Good Practice Guidelines for Excavations
    - a stand-by person (not in the excavation) must be in place in case of an emergency
- No person is to ever enter an unsupported section of the excavation.
- No worker is to stand/walk/work under a suspended load.

If excavation works reveal objects of archaeological significance works are to be stopped and the Project Manager notified immediately.

Training and Competency

Any workers trained and competent should plan and oversee excavations. Refer to the WorkSafe NZ Good Practice Guidelines below.

If operating mobile plant refer to 'Mobile Plant' for information on safe operating and training and competency.

If using a harness refer to 'Work at Height' for information on safe use and training and competency.

Table 1: Recommended competencies for excavation work

Excavation Depth and Type – Normal Conditions[1]	Recommended Competency
Up to 1.5m • Shored[2], benched, and/or battered	• Recent experience in carrying out or supervising excavation work
1.5m – 3m • Flat, open ground, no surcharge • Shored[2], benched, ad/or battered	• Recent experience in carrying out or supervising excavation work at these depths. • Technical or trade qualification (e.g. as a civil engineer or drainlayer)
3m – 6m • Flat, open ground, no surcharge • Shored[2], benched, and/or battered • (e.g shored as per table 6, waler and brace solutions up to 6m in depth)	• Technical or trade qualification (e.g. as a civil engineer or drain layer) • Recent experience in carrying out or supervising excavation work in similar ground at these depths • Experienced temporary works designer able to interpret the site's soil information

Table 2: Recommended competencies for more complex excavation work

Excavation Depth and Type – Complex conditions not covered in table 1[4]	Recommended Competency
Up to 3m • Shored[2], benched, and/or battered	• Experienced temporary works designer[3] able to judge whether it is safe
Over 3m • Requiring detailed analysis of site, significant structural design analysis and sound engineering judgement • Shored[2], with benched and/or battered sides • All sheet piled excavations (cantilevered, propped, or ground anchored), and excavations shored with H-pile shoring and lagging • Shafts and drives framed with timber or steel with poling boards, lagging or laths. Supported by pre-cast concrete, steel caissons/plates etc.	• Experienced temporary works designer[3] able to judge whether it is safe • Can provide producer statements: PS1-design, and PS4 - construction review

1	Generally flat open ground, with little or no surcharge loading, favourable ground conditions, off set from nearby structures and sensitive infrastructure. Groundwater can be controlled with simple methods, such as a sump pump arrangement.
2	Shoring that comes with documents stating what depths or soil pressure it can be used to (e.g. slide-rail shoring). Alternatively, shoring designed to specific soil load profiles (e.g. trench shields).
3	Through training qualifications or experience, has acquired the knowledge and skills to competently excavate to this depth, for example: - someone who has industry training and expertise, experience, knowledge and skills to excavate to this excavation's depth and type - Chartered Professional Engineer with experience designing temporary works, holding formal Engineering qualifications (e.g. Civil, Structural or Geotechnical).
4	The conditions may include very weak or sensitive soils, groundwater that require specialist dewatering or locations near structures and sensitive infrastructure. These conditions would result in an elevated risk when constructing the excavation.

Notifiable Work:

- Excavation works may require to be notified to WorkSafe New Zealand the requirement is listed below:
    - Work in any pit, shaft, trench, or other excavation in which any person is required to work in a space more than 1.5 meters 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 in any excavation in which any face has a vertical height of more than 5 meters and an average slope steeper than a ratio of 1 horizontal to 2 verticals

Notifications must be made by Ryman and the contractor. Ryman is not required to make a new notification for each stage of the project, if an all-encompassing hazardous work notification is in place for the project for Notifiable Excavation. For any excavations that pose a risk of falling from height i.e. into the excavation refer to 'Work at Height'.

Any work that meets these criteria must be notified to WorkSafe via the online form: https://forms.worksafe.govt.nz/hazardous-work-notification.

References and Resources:

- Good Practice Guidelines for Excavation Safety
- Heritage New Zealand Pouhere Taonga Act 2014