WATER SERVICES ASSOCIATION
OF AUSTRALIA

OHS&W RISK TREATMENTS

Part 1 Excavations

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FOREWORD

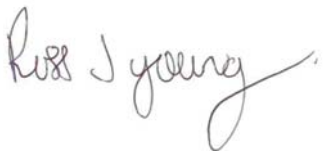
There is nothing more important than providing a safe working environment for employees and contractors working for the urban water industry in Australia and New Zealand.

It is also worth reminding ourselves that no one organisation or individual has a monopoly on wisdom in the myriad activities undertaken by the urban water industry as it delivers the continuous provision of drinking water and wastewater services.

The realisation that there is great benefit in accessing the knowledge and wisdom that resides in the 30 WSAA Members led to a decision to develop Occupational Health Safety and Welfare Risk Treatments for key activities undertaken by the urban water industry.

The OHS&W Risk Treatment Part 1 Excavations is the first risk treatment to be prepared. By virtue of OHS&W legislation already in place at the Federal, State and Territory levels across Australia and in New Zealand, the risk treatments are necessarily prepared at a minimum level setting out principles and procedures that address the legislation that exists in each jurisdiction and which allows individual water utilities to adapt their own OHS&W procedures and policies taking into account the minimum requirements.

I encourage water utilities across Australia and New Zealand to review their OHS&W policies and procedures in relation to excavations and, where required, make the necessary changes to ensure that they are at least adopting the minimum requirements.



Ross Young
Executive Director
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CONTENTS

1 PURPOSE

The purpose of this document is to provide a minimum acceptable treatment for the identification, assessment and control of hazards associated with excavations in accordance with legislative requirements.

2 SCOPE

This treatment applies to all excavations performed within Australia and New Zealand as part of Water Services Association of Australia's "OHS&W Risk" Project.

3 DEFINITIONS

Backfill Material used for refilling excavations

Batter The stable, formed slope of an excavation or earth bank, cut to an angle usually less than the natural angle of repose to prevent earth slippage

Competent Person A Competent Person is considered 'one who has acquired through training, qualification or experience, the knowledge and skills to perform the task competently'

Dial Before You Dig A 'One Call Service' to locate underground utility services that operates in all States and Territories within Australia. The number to call Australia-wide is 1100

DigSAFE A 'One Call Service' to locate underground utility services that operates in New Zealand. The number to call NZ-wide is 0800 DIGSAFE or 0800 344 723

Excavation Means a hole in the earth, or a face of earth, formed after rock, sand, soil or other material is removed (such as a trench, ditch, shaft, well, tunnel, pier hole, cutting or caisson or a hole drilled in the earth)

Potholing The excavation of a small hole, often using vacuum equipment, to identify and confirm the location of buried services.

Safe slope A safe slope does not flatten when left for a considerable period, there is no movement of material down the slope and the toe of the slope remains in the same place

Safe Work Method Statement A statement which describes how work is to be carried out. It identifies the work activities assessed as having a safety risk and outlines the control measures one would take to prevent identified hazards. Also known as a *Job Safety Analysis*

Shielding A method of providing protection of workers within the excavation from cave-ins by means of a shield or a system of shields capable of withstanding the forces imposed by a cave-in. Also known as *trench boxing* or *trench shielding*

Shoring A method of supporting the sides of an excavation to prevent cave-ins by means of a shore or a system of shores

Spoil Excavated material

4 RESPONSIBILITIES

A Competent Person shall:

(a) maintain supervision of employees when excavation work is being carried out;

(b) identify hazards and assess risk in and around excavations;

(c) be authorised to take prompt, corrective action to eliminate hazards; and

(d) have the ability to detect conditions in excavations that could cause harm or damage.

A Competent Person must possess a sound knowledge of:

(i) Identifying and locating underground services.

(ii) Hazard identification and risk management process for excavations.

(iii) Safe work practices for excavation work.

(iv) How to identify soil types.

(v) Relevant OHS&W legislation.

5 PROCEDURES

5.1 RISK ASSESSMENT (HAZARD ASSESSMENT)

A person at a workplace, who is an employer, the main contractor, self-employed person or a person in control of the workplace shall:

(a) conduct a risk assessment prior to commencing an excavation to assist in the identification, assessment and control of potential and existing hazards;

(b) undertake a site inspection prior to completion of the risk assessment;

(c) notify the property owner or entity having responsibility in the case of public land; and

(d) notify adjacent property occupiers.

The identification and risk assessment process shall take into account at least, but not limited to, the following:

(e) Nature of the ground.

(f) Depth of excavation.

(g) Location and proximity of underground and overhead services.

(h) Likelihood of flooding.

(i) Interaction with other work activities being undertaken at or near the excavation.

(j) Plant to be used on site.

(k) Traffic management.

(l) Public safety.

(m) Excavation support.

(n) Vibration near excavation.

(o) Structures above or adjacent to the excavation.

(p) Isolation procedures.

(q) Confined space entry.

(r) Materials and loads above and near excavations.

(s) Backfilling.

(t) Provision of amenities.

(u) Securing of site.

(v) Site signage.

The results of the risk assessment shall form the basis of the Safe Work Method Statement.

5.2 PREPARATION AND PLANNING

5.2.1 Work method statement

A safe work method statement must be available for excavation work onsite.

5.2.2 Permit to work

5.2.2.1 *Planned work*

Commencement of excavation work shall be preceded by the appropriate work notification protocols for the particular utility (work order, work permit etc.). Notification of work shall occur at least 24 hours prior to planned work.

Responsibility for completion of the permit lies with those persons with overall control of the workplace. A work permit shall include the Safe Work Method Statement for the particular work to be undertaken.

5.2.2.2 *Emergency/reactive work*

Where the normal permitting system for planned work is not possible due to the urgent nature of the required response, the following activities shall precede the commencement of work.

(a) Visual site services search.

(b) Pothole to verify services.

(c) Dial Before You Dig in Australia.

(d) DigSAFE in New Zealand.

5.2.3 Location of services

All services shall be located prior to commencement of excavation work.

Services shall be located via

As a minimum, the following service location activities shall precede the commencement of work:

(a) Contacting “Dial Before You Dig” in Australia and “DigSAFE” in New Zealand and, as appropriate, other utilities.

(b) Referring to records of concealed cables, pipelines and other services or contaminated ground within the work area.

(c) Carrying out inspections to locate services using electronic service location, probing or potholing with insulated tools, visual inspection or other appropriate means.

If high-pressure or secondary pressure gas mains, high voltage cables, oil or fuel pipelines, fibre-optic data transmission cables and any other high risk utility services are

detected, their precise location shall be determined by a representative from the utility responsible for the service.

5.3 WORK SYSTEMS AND CONTROL MEASURES

5.3.1 Safe work in and around excavations

5.3.1.1 *Competent Persons*

A Competent Person must supervise workers whilst excavation is being carried out.

5.3.1.2 *Supervision*

Persons working in excavations deeper than 1.5 m should have at least one person assisting them at all times.

If working alone appropriate systems of communication shall be available to maintain regular contact.

5.3.1.3 *Mobile plant*

An effective communication strategy should be in place where mobile plant is used. This should include, but not be limited to, the following requirements:

(a) A system of communication and warning to mobile plant operators and ground personnel.

(b) Mobile plant operating near personnel is required to be equipped with a reversing alarm, revolving lights and hydraulic anti-burst valve.

(c) The use of a spotter.

(d) All personnel within the vicinity of mobile equipment to be within eyesight of plant operator.

5.3.2 Public safety

5.3.2.1 *General*

The risk assessment shall include a determination made on the need for appropriate signage, barriers including hoarding, barricading and/or reflective tape/mesh in compliance with relevant the relevant legislation, codes of practice and guidance materials.

5.3.2.2 *During working hours*

Warning signs in compliance with AS/NZS 1319 shall be erected on approach roads to the excavation. A temporary by–pass for vehicle traffic and traffic control shall be provided if required.

Access shall be established with directional signs.

If an excavation is on a gazetted road, all signs, traffic control and safety measures shall comply with road traffic control authority’s legislation, codes of practice and guidance materials.

Traffic and pedestrian control shall be in place and, where appropriate, kept separate.

Erected barricades must be a minimum of 900 mm high around a trench unless only the workers involved with the excavation will be in the area, or another form of compliant barrier exists.

5.3.2.3 *Preparation to leave the site unattended*

Appropriate barriers shall be erected around the excavation.

Warning lights and reflective signs shall be provided to warn on-coming vehicular and pedestrian traffic.

Excavations on driveways and roadways must be backfilled before the end of the working day if practicable and, where not practicable, erect appropriate barriers, vehicular and pedestrian traffic management and compliant temporary covers of excavation.

Where an excavation interacts with electrical switchyards, railway protection, swimming pools, schools, shopping centres and other public areas, temporary fencing, together with other precautions, shall be provided in accordance with relevant the relevant legislation, codes of practice and guidance materials.

Orange plastics mesh or other non-fixed fencing is not acceptable as a control for open excavations on unattended sites. In the event that plastics mesh fencing is used as temporary barricade, star posts must be capped.

5.3.3 Worker safety

5.3.3.1 *Personal protective equipment*

The Principal Employer, Contractor or Sub-Contractor shall provide PPE.

Regular monitoring of PPE usage and condition must be in accordance with risk assessment.

All persons working in and around excavation sites shall wear:

(a) Head protection in compliance with AS/NZS 1801.

(b) Hearing protection in compliance with AS/NZS 1269, where noise is in excess of prescribed exposure limits.

(c) Wide brim hats and sunscreen with SPF 30 on exposed body parts.

(d) High visibility garments.

Where there is risk of worker exposure to chemicals, protective clothing shall be provided.

Where there is risk of worker exposure to atmospheric contaminants, respiratory protective devices complying with AS/NZS 1716 appropriate to the risk shall be provided.

Where there is risk of hand injury from exposure to chemicals or mechanical equipment, gloves complying with AS/NZS 2161 appropriate to the risk shall be provided.

5.3.3.2 *Access*

Safe access to the excavation must be provided.

A safe and fixed means of ingress/egress to surfaces 1 or more metres above or below ground is required using ladders, stairways or ramps.

5.3.3.3 *Ladders*

Ladders must be secured at a minimum 900 mm above landing and comply with AS/NZS 1892 unless otherwise required by the relevant legislation, codes of practice and guidance material.

Ladders must be secured at both top and bottom where practicable.

Metallic or reinforced ladders shall not be used where there is any likelihood of contact with power lines or electric shock.

5.3.3.4 *Ramps*

Ramp slopes shall not exceed 1:2.7 (22 degrees). Ramp slopes exceeding 1:8 (7 degrees) should be cleated, grated and be strong enough to withstand the anticipated load.

5.3.3.5 *Fumes, emissions and hazardous atmosphere*

If there is likelihood that hazardous fumes may be present in the excavation, gas testing is required and a ventilation system or exhaust system put in place. Additional appropriate control measures may need to be considered.

5.3.3.6 *Lighting*

Adequate lighting shall be provided for detailed work, dangerous processes or where machinery is being operated.

5.3.3.7 *Underground and overhead services*

All services shall be located prior to conducting excavation (Refer to Clause 5.2.3).

Utility permits to excavate shall be obtained and be in the possession of the Competent Person during excavation where required by the relevant legislation, codes of practice and guidance materials.

Excavation with machinery or power tools shall not be undertaken within the clearance specified by the utility owning the service or within 300 mm in any event.

A safe system of work in relation to electrical hazards shall be taken into consideration including, but not limited to, the following:

(a) De-energising and isolating the cables and obtaining documented evidence of the continued isolations prior to commencing excavation.

(b) A system lock-out and lock-out of tags.

(c) Hand digging using non-conducive tools.

(d) Wearing rubber boots and insulation gloves.

If persons are working in the vicinity of overhead power lines the appropriate safe working distances for plant and equipment shall be, unless otherwise stipulated by the relevant legislation, codes of practice and guidance materials:

(i) 0.5 metres for insulated overhead lines or aerial bundled conductor lines ≤1000 V;

(ii) 1 metre for non insulated overhead lines >1000 V;

(iii) 3 metres or less for voltage <132 kV;

(iv) 6 metres or less for voltages from 132 to 330 kV; and:

(v) 8 metres or more for voltages >330 kV.

A person other than the operator of the plant or equipment must be present to observe and direct during the task.

If the voltage of power lines is unknown they should be treated as live and a danger zone of 8 metres or the maximum safe working distance stipulated within the relevant legislation, codes of practice and guidance materials adopted.

5.3.3.8 *Fall prevention*

Where there is possibility of fall as identified by a risk assessment, fall prevention systems shall be implemented.

If at risk of falling 3 metres or more, fall protection must be provided and implemented using the “hierarchy of control” when deciding on the following control measures:

(a) Guard rail with top/mid and toe board and meshing; or

(b) Fall arrest, lanyard and anchor point.

5.3.3.9 *Drainage*

Surface water shall be prevented from entering the excavation or collecting in the working area.

Subsoil drains shall be diverted away from site wherever possible.

Any inflow into the excavation shall be collected in a sump and pumped clear of the excavation in accordance with the requirements of the relevant environmental regulatory authority.

5.3.3.10 *Manual handling*

Employers must assess and control risks in carrying out manual handling tasks in consultation with employees in accordance with the National Standard for Manual Handling [NOHSC:1001(1990)] and relevant legislation and guidance material.

5.3.4 Working in contaminated environments

Where there is risk of inhalation of harmful airborne substances such as gases and fumes, the employer must implement a safe system of work to ensure a safe respirable atmosphere and effective ventilation in compliance with relevant legislation, codes of practice and guidance materials.

Appropriate assessment of exposure levels shall be undertaken before selecting control measures.

If there is risk of a workplace atmosphere changing, the workplace must be continually monitored.

If an excavation is identified as a confined space, work shall be carried out in accordance with relevant legislation, codes of practice and guidance materials including AS 2865.

5.3.5 Site inspections

Because an excavation is dynamic with an ongoing likelihood of movement of soil, people and plant, an inspection by a Competent Person should occur prior to people first entering the excavation, prior to the start of work each day and after any event that may alter the stability of the excavation.

The inspection should include, but not be limited to, the following:

(a) Underground services near or crossing an excavation.

(b) The ability for workers to enter an unsupported excavation.

(c) Loads/machinery too close to the edge of an excavation.

(d) Cracks near or parallel to the edge of an excavation.

(e) Subsidence along side of an excavation.

(f) Water swelling or uplift on bottom of an excavation.

(g) Surface soil falling into an excavation.

(h) Workers climbing on the support system.

(i) Nearby machines causing vibration.

(j) Undercut sides of an excavation.

(k) Surface and groundwater entering an excavation.

(l) The ability for workers to access parts of an excavation outside the support system.

(m) Nails sticking out of timbers.

(n) Loads supported by shoring systems.

(o) Trees adjacent to an excavation.

5.3.6 Excavation support

5.3.6.1 *Safe slope*

The safe slope for a face of an excavation will depend on the depth of cut, the type and moisture content of the soil, the condition of the material in the face and the length of time the face will be required to stand.

Conversely, there may be situations where steeper slopes are safe due to favourable geological conditions or the absence of groundwater. Where the excavation is deeper than 1.5 metres, steeper slopes should only be used on the basis of the assessment and advice of an appropriately experienced engineer.

Support systems shall be installed and benching and battering shall be prepared by an appropriately qualified or Competent Person.

5.3.6.2 *Working under or adjacent to structures*

Where the stability of adjoining buildings, roads, walls, paths, pavements or other structures is affected by excavation, an investigation into the need for additional support system shall be undertaken prior to commencement. Any additional support required must be implemented and included in the Safe Work Method Statement.

5.3.6.3 *Deep or long excavations*

For excavations deeper than 6 m or long enough in length that there is a soil change, a Competent Person shall specify the safe slope.

The safe slope shall be reassessed regularly and, if a change in weather conditions occurs that may increase the likelihood of an excavation collapse, a decision about continuing work shall be made by the Competent Person.

5.3.6.4 *Spoil*

Spoil shall be placed no closer than 1 m from edge of excavation or zone of influence or such greater distance specified in the relevant legislation, codes of practice and guidance materials.

5.3.6.5 *Benching*

If an excavation exceeds 3 m in depth and has ample room, benching in 3 m intervals with at least 1.2 m width may be provided in lieu of shoring.

5.3.6.6 *Shoring system*

A shoring system shall be used where ground conditions are solid and the excavation exceeds 1.5 m deep. In cases where the soil is not solid, shoring shall be used at all times regardless of depth. Appropriate allowances shall be made in locations where groundwater is present. If the excavation is in an area subject to influencing factors such as vibration from passing traffic or heavy equipment, additional shoring may be required.

All steel shoring equipment shall be designed in accordance with AS/NZS 4744.

All timber shoring systems shall be designed, supplied and assembled in accordance with the manufacturer’s specifications.

5.3.6.7 *Shielding system*

Where a shielding system is utilised, it shall be assembled and installed in accordance with the manufacturer's specifications.

Shield boxes shall be lifted by the lifting points and not from the struts or spreader bars during installation.

Excavation of material below the bottom of the shield box is only permitted if the box is designed to resist the forces of full excavation. Over-excavation shall not exceed 600 mm.

5.3.7 Removal of excavation support

Under no circumstances shall shoring and shielding systems be partly removed unless it is for the purpose of complete removal and backfilling.

When removing shoring and shielding systems, the support systems shall be removed in reverse order of its installation.

Persons performing the work in the excavation shall not be outside of the excavation support systems.

Cranes or mobile plant selected to remove support systems shall have sufficient capability to safely handle the dead and dynamic loads.

5.3.8 Emergency procedures

An employer shall ensure that in the event of an emergency there are means to ensure worker safety on-site. This may include, but not be limited to:

(a) A warning and communication system.

(b) Emergency procedures and rescue plans.

(c) Personnel trained in emergency procedures and rescue plans.

(d) Access to appropriate medical treatment and evacuation.

(e) Shutdown of work/equipment.

(f) Fire and rescue equipment and procedures for the use of such equipment.

(g) Alternative access points to an excavation shall be provided where practicable.

6 TRAINING AND INSTRUCTION

Only persons who have received the relevant training and instruction, and who hold appropriate certificates of competence and/or licences as required, may carry out the work.

All persons involved in any excavation or associated work shall be instructed to follow systems of work that enable them to perform work in a safe manner.

Training shall be in addition to, and not replace, the requirement for site-specific induction.

Training and instruction programs shall include:

(i) Induction in the relevant regulatory requirements including safe methods of excavation.

(ii) Identification of hazards associated with excavations.

(iii) Selection, fitting, care, use and storage of personal protection equipment (PPE).

7 REFERENCES

AS/NZS

1269 Occupational Noise Management

1716 Respiratory protective devices

1801 Occupational protective helmets

1892 Portable ladders

1319 Safety signs for the occupational environment

2161 Occupational protective gloves

2865 Safe working in a confined space

4744 Steel shoring and trench lining

NOHSC

1001 National Standard For Manual Handling

8 RELATED DOCUMENTS

ACT

- Occupational Health and Safety Act 1989
- Occupational Health and Safety Regulations 1991
- ActewAGL – Water Division Instruction Excavating

New South Wales

- Occupational Health and Safety Act 2000
- Occupational Health and Safety Regulations 2001
- Code of Practice for Excavations
- Excavation Safety HSP-053

New Zealand

- Health and Safety in Employment Act 1992
- Health and Safety in Employment Regulations 1995 P2 S10-26
- Code Of Practice for Safety in Excavation and Shafts for Foundations

Northern Territory

- Work Health Act 2000
- Work Health Regulations 2006

Queensland

- Workplace Health and Safety Act 1995
- Workplace Health and Safety Regulations 1997
- FM 130 Excavation Trenching
- WMS 003Excavation Trenching
- Risk of Falls
- MSC- SMS- PO-017
- WMS 004 – Risk of Falls

South Australia

- Occupational Health, Safety and Welfare Act 1989
- Occupational Health, Safety and Welfare Regulations1995
- Procedure for Safety in Excavation & Digging 02

Tasmania

- Workplace Health and Safety Act 1995.
- Workplace Health and Safety Regulations 1997
- Safe Precautions in Excavation Operations

Victoria

- Occupational Safety and Health Act 2004
- Occupational Health and Safety Regulations 2007 “Prevention of Falls”
- Code of Practice Safe Precautions in Trenching Operations 1988
- Fall Prevention in Trenching Operation (Civil Contractors Federation
- Construction Safety Manual (Excavations)

Western Australia

- Occupational Health and Safety Act 1984
- Occupational Health and Safety Regulations 1996
- Code of Practice: Excavation 312
- Procedure for Excavations