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GROUND WORKS

HYER STANDARD

PROCEDURE

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PURPOSE AND SCOPE

The purpose of this procedure is to ensure ground works and excavations (including trenches) are conducted and maintained safely as a means of providing a safe work environment. This procedure applies to all Hansen Yuncken projects where ground works or excavation work is conducted.

Ground works includes any work that disturbs the ground, including but not limited to:

- Excavations
- Trenching
- Drilling/piling

- Penetration (i.e. star pickets or stakes)
- Potholing

RESPONSIBILITIES

SENIOR PROJECT MANAGEMENT TEAM:

- Ensure service locations are identified prior to penetrating ground, including temporary services installed by HY
- Ensure reports and verifications have been obtained from a geotechnical engineer where required
- Ensure Plant and Equipment has been inspected and verified as safe for use prior to use on site
- Ensure applicable Work Permits, including authority permits, are implemented prior to commencing work
- Ensure only trained and competent persons perform work on site
- Ensure worker competencies and qualifications are verified prior to commencing work
- Ensure that SWMS are provided for any work that is carried out in or near a shaft or trench with an excavated depth greater than 1.5 metres

HAZARD IDENTIFICATION RISK ASSESSMENT AND CONTROL (HIRAC)

All risks associated with ground works and excavation work are to be included in the project risk register. This includes risks associated with:

- Striking underground and/or overhead services
- Collapse of trench or excavation
- Contaminated soil
- People or objects falling into the trench or excavation
- Ingress of water and/or other liquids
- Airborne contaminants in the trench or excavation
- Causing water pollution through run-off (from rainfall or wash down activity)
- Work in proximity to traffic and/or moving plant

The following should be considered when identifying controls:

- Ground conditions
- Weather conditions
- Plant/equipment used in and adjacent to the excavation
- Adjacent structures and buildings
- Environmental protection (e.g. dust control, storm water run-off)

NOTIFICATION

In Victoria, the regulator must be notified at least three days before commencing work on a shaft, tunnel or trench if:

- The excavation will be of sufficient dimensions or depth to allow the entry of a person; or
- There will be a risk to the health or safety of any person from the excavation.

The notice must be in writing and must include the following:

- The name of the person who is making the notice
- The name of the person directly supervising the proposed construction excavation work and that person's contact details
- The date of the notice
- A description of the type of construction excavation proposed
- Whether explosives will be used in carrying out the proposed construction excavation
- The date or dates on which construction excavation work is likely to commence and be completed
- The location or locations of the proposed construction excavation work

GROUND WORKS PERMIT

A Ground Works Permit must be raised prior to any excavation works commencing in accordance with the Works Permit procedure. The permit must detail the nature of the works and methods used to prevent ground collapse. It must also have attached all relevant supporting documentation e.g. current DBYD, as built drawings, services layouts, engineers report etc. The permit must be in hard copy with the operator/excavation crew.

The following personnel should be involved in the development of the ground works permit:

- The Issuer (HY Site Manager/ Foreman/ HSE Coordinator/ Engineer)
- The Acceptor (a competent subcontractor supervisor)
- The plant operator and spotter (need to be aware of service locations to prevent damage)
- All workers involved with the task (need to be briefed on the hazards associated with the ground works works, the proximity of underground services, protection requirements and exclusion zones)
- Services Trades Emergency Contacts
- Other contractors (if their assets may be affected by the works being carried out)

ASBESTOS

Ground works may uncover asbestos in the material being excavated (e.g. from underground water pipes, illegal dumping of waste, previous demolition work). If asbestos and/or Asbestos Containing Material (ACM) is identified or suspected, the Asbestos Management procedure must be followed.

ADJACENT BUILDINGS AND STRUCTURES

Excavation work may seriously affect the security or stability of any part of a structure at or adjacent to the location of the proposed excavation which can lead to structural failure or collapse.

Excavation work must not commence until the area is assessed by a competent person (i.e. structural and/or geotechnical engineer) and suitable controls have been implemented to ensure the integrity of all structures is maintained.

Consideration must be given to the potential impact of excavation works on surrounding buildings and structures as damage may be caused through excessive vibration or concussion during the excavation work.

SERVICES

All underground and overhead services must be managed as per the Overhead and Underground Services procedure.

BARRICADING AROUND EXCAVATIONS

The work area where the excavation work is to take place must be secured to prevent unauthorised access. In securing the excavation, consideration should be given to factors such as how long the excavation will be open, depth, location and who may gain unauthorised access. Weather conditions (wind, rain etc), ground conditions, and zone of influence must also be taken into account.

For excavations up to 1m deep, star pickets (with safety caps) placed at a maximum of 2.5m apart, with barrier mesh installed so there is no gap at the bottom may be used.

Piled holes are to be protected once fill has been extracted. Suitable protective structures must be in place to prevent persons, plant, or equipment from falling into or becoming lodged in the hole. Suitable protection includes physical barriers that cannot be easily moved, such as pile hole guards with solid footplates or water filled barriers.

EXCAVATED MATERIAL AND LOADS NEAR EXCAVATIONS

Mechanical plant, vehicles and storage of materials including excavated material or other heavy loads must be excluded from at least 1m beyond the 'zone of influence' of an excavation unless the ground support system installed has been designed by a competent person (e.g. geotechnical engineer) to carry such loads.

Storage of materials (including location) must be done in such a way that:

- Minimises the risk of ground collapse
- Reduces increasing the effective height of the excavation

- Minimises the risk of material falling into or being washed into the excavation
- The risk of triggering pollution events by water or wind is controlled by containing and covering excavated materials

MOBILE PLANT

Mobile plant should not operate or travel near the edge of an excavation unless the ground support system installed has been designed by a competent person to carry such loads. Physical barriers, such as wheel stoppers or berms, may be used to restrict plant movement near excavations.

Mobile plant must be managed and operated as per the Mobile Plant procedure.

WORK AT HEIGHT

The risks associated with people working adjacent to and in the excavation must be managed from a falls perspective. This includes preventing people and objects from falling into the excavations and providing safe access and egress to the excavation. Control measures may include:

- The support system itself (e.g. trench box extensions or trench sheets longer than the trench depth)
- Guard rails or covers on trench shields
- Guard rails and toe-boards installed into the ground immediately next to the supported excavation side
- Landing platforms or scaffold towers inside deep excavations
- Ladders secured to trench shields and extending 1m above top of excavation
- Barriers or barricades
- Backfilling the excavation as work progresses
- Alternative access points (e.g. ladders, ramps, steps, scaffold) at locations based on the type of excavation and level of risk involved

Risks associated with work at height must be managed as per the Work at Height procedure.

ATMOSPHERIC CONDITIONS

The risk of atmospheric contamination through a build-up of gases and fumes must be controlled in excavation work. This includes gases, sulphur dioxide, engine fumes, carbon monoxide and carbon dioxide. It also includes leakage from gas bottles, fuel tanks, sewers, drains, gas pipes and LPG tanks.

Ventilation systems may help to maintain oxygen levels and dilute flammable gases and fumes.

Plant that uses a combustion engine (e.g. generators) must not be used in an excavation if workers are in the excavation. The build-up of exhaust gases in the excavation, particularly carbon monoxide, can cause death.

Atmospheric testing must be undertaken if:

- it is not certain if the airborne concentration of a substance or mixture exceeds the relevant exposure standards, or
- monitoring is necessary to determine whether there is a risk to health

If atmospheric testing or air monitoring is to be undertaken, the requirements in the Health Surveillance and Workplace Monitoring procedure must be followed.

CONFINED SPACES

Excavations must be assessed to determine whether they are a Confined Space. If so, then the requirements in the Confined Space procedure must be followed.

POTENTIAL WATER SOURCES AND ENGULFMENT

Possible water sources must be identified and control measures implemented to remove the risk of flooding and/or engulfment due to water infused soil instability. Control measures may include but is not limited to:

- Isolating water supply using physical or mechanical barriers
- Provision of membranes to prevent the rising or inrush of water
- Provision of exploratory or warning holes where water flows at a reduced rate to warn of danger
- Provision of sumps

- Lowering the water table (e.g. use of spear pumps)
- Provision of pumps
- Increasing the number of exit points

PREVENTING GROUND COLLAPSE

When planning the work and selecting excavation methods and control measures to prevent ground collapse, it is important to consider:

- Planned height of the excavated face
- The material to be excavated (i.e. type, strength, moisture content)
- If the ground is level or sloping
- Slope stability and duration of open excavation
- If groundwater (or other nearby watercourses, drains or runoff) are present
- If there are discontinuities or faults in the strata
- If vehicle traffic and powered mobile plant will operate near the excavation
- Other loads adjacent to the planned excavation (e.g. buildings, tanks, retaining walls, trees)
- If there will be other construction activity nearby that may cause vibration

Where HY considers there is a risk of ground collapse, the relevant Subcontractor must be instructed to obtain advice from a qualified Geotechnical Engineer. This may be sought for the whole site prior to commencement of any relevant excavation works or for specific excavations depending on project requirements.

BENCHING AND BATTERING

Benching and battering must be designed by a competent person 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.

Benching and battering may not be required where a Geotechnical Engineer has determined the excavation is in stable rock or has assessed that there is no risk of collapse.

When benching or battering the walls of an excavation, an angle of repose of 45 degrees should not be exceeded unless designed by a competent person and certified in writing.

In Victoria, no vertical side for benching is to exceed 1m.

Benches should be wide enough to stabilise the slopes and to prevent material from the top falling down to the working area. They should also be sloped to reduce the possibility of water scouring.

All Benching and/or Battering must comply with the designer's advice and be monitored by a competent person nominated by the Subcontractor.

SHORING

Where ground is not self-supporting and benching or battering are not practical or an effective control measure, shoring should be used. Shoring systems must be:

- Designed by a qualified engineer
- Detailed on up-to-date drawings/plans
- Installed by competent persons and verified as correctly installed prior to use in accordance with the drawing/plan, and
- Authorised and signed off by a qualified engineer where changes to the design or installed system are made
- Shoring must be managed as per the Temporary Works procedure.

INSPECTION AND MONITORING

The soil condition and the state of shoring, battering and trench walls must be frequently checked by a competent person for signs of earth fretting, slipping, slumping or ground swelling. Where necessary, repair of the excavation or strengthening of the shoring system from above must occur before allowing work below ground to continue.

Inspections must be conducted regularly (or following a significant rainfall event) as per geotechnical advice to confirm excavation integrity and recorded as part of:

- Site HSE Inspections
- Task Observations
- Prestart meetings
- Site Diary

The Subcontractor must submit records of the competency of their nominated representative to conduct such inspections as part of the Skills & Competency record with the Safe Work Method Statement.

GEOTECHNICAL REPORT

A Geotechnical Report may be obtained for a specific area or all of site prior to work starting. Geotechnical Reports must be developed by a Geotechnical Engineer following an investigation of existing site conditions. This should include an assessment of the existing stability of the area and details of geotechnical constraints on building, excavation, and/or other development works on the site.

Recommendations set out in the report are to be adhered to so far as reasonably practicable.

A Geotechnical Report should be obtained depending on the work activities or site conditions. A Report should be obtained:

- Where doubt exists as to the suitability of ground conditions for specific works
- If works require an Engineered Work Platform (i.e. Piling activities)
- To obtain advice on suitable controls to prevent ground collapse

Geotechnical advice is to be sought if inclement weather or flooding affects the ground conditions of a work area. Advice on how to maintain the area may be obtained in the report if weather or flooding persists.

EMERGENCY PROCEDURE

Where excavation work is being undertaken at a site, the procedures for the response to an emergency related to excavation must be included in the Emergency Response Plan and the SWMS. When establishing emergency procedures, the following must be considered:

- The range of unexpected emergencies e.g. ground slip, engulfment, flooding, gas leaks, other airborne contaminates
- Underground and overhead service strikes
- How to rescue workers from an excavation

DEFINITIONS AND ABBREVIATIONS

DBYD – Dial Before You Dig

Excavation – a trench, tunnel or shaft, but does not include:

- a mine
- a bore to which a relevant water law applies, or
- a trench for use as a place of interment

Trench – a horizontal or inclined way or opening:

- the length of which is greater than its width and greater than or equal to its depth
- that commences starts at and extends below the surface of the ground, and
- that is open to the surface along its length

Zone of influence – the volume of soil around the excavation affected by an external load, for example vehicles, plant, excavated material

Battering – to form the face, side or wall of an excavation to an angle, usually less than the natural angle of repose, to prevent earth slippage

Benching – the horizontal stepping of the face, side, or wall of an excavation

Shoring – the use of timber, steel or other structural material to support an excavation in order to prevent collapse so construction can proceed

REFERENCES

- Work Health & Safety Regulation 2011 (QLD), 2012 (SA/TAS) and 2017 (NSW) – Part 6.3, Division 3 Excavation Work
- Occupational Health and Safety Regulations 2017 (Victoria) – Chapter 5, Division 4 Notice of construction excavation work
- Excavation Work (Model Code of Practice)
- Federal Safety Commission (FSC) Audit Criteria – H7 Excavation

ASSOCIATED DOCUMENTS

- HYer Standard – Ground Works
- Quick Guide – Silica Management (<https://www.hyworkzone.com.au/silica-management-quick-guide/>)
- Quick Guide – Work Zones (<https://www.hyworkzone.com.au/work-zones-quick-guide/>)
- Ground Works Permit
- Asbestos Management procedure (<https://www.hyworkzone.com.au/asbestos-management-procedure/>)
- Confined Space procedure (<https://www.hyworkzone.com.au/confined-space-procedure/>)
- Mobile Plant procedure (<https://www.hyworkzone.com.au/mobile-plant-procedure/>)
- Underground and Overhead Services procedure (<https://www.hyworkzone.com.au/underground-and-overhead-services-procedure/>)
- Temporary Works procedure (<https://www.hyworkzone.com.au/temporary-works-procedure/>)
- Work at Height procedure (<https://www.hyworkzone.com.au/work-at-height-procedure/>)
- Work Permits procedure (<https://www.hyworkzone.com.au/work-permits-procedure/>)

Last Modified: July 25, 2022

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