Underground Safety

Couple of takeaways

- Work conducted in underground facilities need to be effectively managed to ensure risks related to air quality and emergency processes are controlled.
- An Underground Management Plan is required for all inspections or other work conducted in underground structures.
- Ventilation and air quality is an important consideration for work underground, especially when operating plant and machinery.

What is this procedure for?

Hydro Tasmania group is committed to the prevention of fatalities, injuries, accidents, incidents, and the improvement of underground safety. In meeting this objective, Hydro Tasmania group will raise awareness of underground safety issues amongst Hydro Tasmania group employees, promote underground safety and ensure its people and contractors are safe underground workers operating safe machinery.

The workplace health and safety laws require employers to provide information, instruction, training, and supervision to their employees, to enable them to carry out their work safely. This requirement also applies to underground safety and with the total length of tunnels and shafts about 70 kilometres, Hydro Tasmania is committed to reducing the risks associated with inspection and underground work and meeting the duty of care requirements under the workplace health and safety laws.

This procedure covers:

- This procedure covers information for Hydro Tasmania group employees that enter underground work locations
- Contractors used by Hydro Tasmania for underground work
- Machinery (equipment and vehicles) owned or used by Hydro Tasmania group and its contractors in underground locations.

The objectives of this procedure are to ensure that:

- Our employees consider safety a vital part of the successful performance of their job
- Employees have the underground safety knowledge and skills to carry out their work safely.
- Hydro Tasmania group vehicles used underground shall have diesel-powered engines or alternatives to the petrol-powered engines and are safe and correctly maintained.
- Incidents, accidents, and complaints are reported and investigated.
- Hydro Tasmania group is proactive in developing and implementing underground safety initiatives.
- Hydro Tasmania group encourages and promotes underground safety to work-related Hydro Tasmania group employees and contractors.

What are the roles and responsibilities?

Hydro Tasmania group manager

The responsible officer is accountable to provide the necessary resources to ensure safe systems of work that ensure this procedure is understood, applied, and observed within their area of authority.

Manager occupational health and safety

The manager occupational health and safety is responsible for:

- Ensuring that training material is current and of an appropriate quality
- Ensuring safety systems are kept up to date in relation to this procedure
- Recording and analysing incident / investigation data
- Ensuring that this procedure is reviewed as stipulated.

Line managers

Have the responsibility for the management or control of a workplace, within their area of authority, and must ensure this procedure is implemented. They shall maintain a hazard and risk register and appropriate signage for their workplace and shall ensure that competent and accountable persons assigned for the management and execution of work within their area of authority, conduct appropriate risk assessments.

Accountable persons

Have the responsibility for following this procedure and ensuring those working under their control follow this procedure. They have responsibility for the safety of personnel following this procedure and for maintaining appropriate records relating to their activities. Line managers, asset owners and their delegates, job managers, site managers and project managers, authorised issuing officers and persons in charge are all examples of accountable persons.

Employee/contractor

Are required to act in a manner that does not adversely affect their own health and safety, or that of others. They may be instructed persons and shall comply with the terms of this procedure and must immediately report to the accountable person any matter that may affect their own or others' health and safety.

Safety observers

Are responsible for following this procedure in respect to their defined role as well as the instructions given by the accountable person.

How is the process managed?

Underground Management Plan

An underground management plan shall be completed by Hydro Tasmania or its main contractor and submitted to the job manager prior to commencement of inspection or work in the underground structure. This plan shall include the following:

- Hazards identified
- Assessment of the risks
- Control measures to be put in place or actions to be taken

- All machinery (equipment and vehicles) to be used underground
- Emergency evacuation plan

To ensure reasonable and practicable measures are taken to control workplace hazards a risk assessment shall be completed as part of the underground management plan. Contractors may use their own workplace risk management systems if they meet or exceed the requirements of the relevant workplace health and safety legislation.

Underground inspections or work

General

All underground personnel shall have current confined space certification and be 'Level 2' inducted.

An above ground induction including rescue procedures shall be undertaken prior to commencement of underground inspections or work. All personnel entering the underground structure shall sign on to the permit to work and confined space permit prior to entry.

When working in areas that are not part of the power system but may be affected by the output of the system e.g., caves below Gordon Dam, an apparatus interface statement shall be completed and submitted to the local permit to work authorised issuing officer for approval.

All Hydro Tasmania group employees and contractors shall comply with the underground management plan for all underground inspections or work.

The atmosphere of the confined space shall be tested as near as practical to the time of entry to ensure the existence of acceptable entry conditions. The atmosphere shall be monitored continuously as per Hydro Tasmania's confined space work procedure. Beware of external factors such as bush fire activity when inspecting or working in the underground structure (confined space).

A personnel tag board for access control shall be located at the main entrance to the underground structure to record whether people are either 'IN' or 'OUT' of that structure. Establishment, operation, and monitoring of this board is the responsibility of the main contractor (if work is being done), otherwise it is the responsibility of Hydro Tasmania group's Authorised issuing officer or Person in charge.

All underground structures are strictly smoke-free zones. All items of machinery (equipment and vehicles) shall carry appropriate fire extinguishers and the type shall either be foam or dry chemical.

Underground inspections

Always check the underground ventilation, air quality and other work, health and safety (WHS) issues prior to commencing work.

- Check retained water upstream of rock falls (generally due to a leaking intake gate).
- Check potential loose rocks in unlined structures or loose lining material in lined structures, especially after tunnel and shaft dewatering.

To minimise the risk of injury to personnel from rock falls, the entry of personnel into a water-bearing underground structure should be delayed for a period after the underground structure has been emptied, in accordance with latest operating instructions or contingency plan. This allows for further ground water pressure dissipation and for any further possible rock falls in unlined sections of the structure to occur. It is

important that all draining, and filling times of the underground structure comply with the latest operating instructions, and that this is documented.

The procedure for determining the time delay between the completion of tunnel draining and entering the tunnel is as follows:

- Refer to the tunnel inspection section of the risk minimisation plan for guidance (applies to John Butters, Wilmot, Tungatinah, Mossy Marsh and Poatina Tunnels).
- Alternatively, refer to the tunnel operating instructions for guidance.
- If the time delay cannot be determined from the above sources consult a geotechnical engineer for advice.
- Additionally, if the documented tunnel draining rate has been recently exceeded, consult a geotechnical engineer for advice before entering the tunnel.

Underground work

Underground work requirements include ventilation, air quality and other WHS equipment as follow:

Ventilation

A guide for ventilation levels when using machinery underground (based on NSW mining regulations) is a minimum of 0.063 cumecs of air per kilowatt of maximum engine power. For example, when a minimix (134kW), Bobcat (30kW), concrete pump (29kW) and small generator (20kW) are in operation relatively close to one another, 13.4 cumecs of air are required to suitably ventilate the tunnel when the machines are working close to maximum output. There may be sufficient natural ventilation through the underground structure when open at both ends. However, periods of limited flow may occur when natural pressures at both ends are similar.

Air quality

Air quality is a function of the machinery working in the underground structure, the power output of the machinery, and the airflow. Air quality shall be tested on a regular basis so action can be taken to ensure the levels of any pollutants remain within acceptable ranges, and a register of recordings shall be maintained at the site office.

Other WHS equipment

Lighting, underground communication systems and generators used, shall be detailed in the underground management plan. An effective underground communication system shall be provided at each workface and on all manned machinery.

Personal protective equipment

The minimum Personal Protective Equipment (PPE) to be used underground shall consist of a safety helmet, safety boots or safety gumboots, to comply with Australian Standards, and a torch or electric cap lamp. The supply of this equipment is the responsibility of Hydro Tasmania group (for its employees only) and the contractors.

If maintenance or construction work is being carried out an electric cap lamp and battery attached to a safety belt, together with a self-rescuer shall be made available by the main contractor and carried by all underground personnel. Prior to entry underground an above ground briefing shall be given by the person in charge or main contractor regarding the use of the self-rescuer and when they need to be used. The self-rescuer may have to be used in the event of a fire underground.

Underground Safety

Depending on the nature of work and the requirements of regulations, ear plugs or earmuffs, dust mask or dust respirator, safety glasses or safety goggles or shields, and appropriate gloves may be required. Areas where these PPE are required will be identified by the authorised issuing officer or person in charge and the supply is the responsibility of Hydro Tasmania group (for its employees only) and contractors.

Additional PPE may be required for specific tasks will be identified by the authorised issuing officer or person in charge.