

How to Protect Workers from Atmospheric Hazards Inside Excavations & Trenches



Don't send workers into excavations until you identify and control its atmospheric hazards.

Any work operation becomes significantly more dangerous when it's carried out inside an excavation or trench. One of the greatest hazards is invisible and thus easy to overlook, namely, the quality of the atmosphere inside the excavation. Here's a briefing of the hazards and how to control them.

The Atmospheric Hazards

Most excavations are considered 'confined spaces' under OHS laws. And like other confined spaces, the air inside an excavation may be dangerous to work in or breathe. Risks include:

- Not enough oxygen, that is, oxygen levels below 19.5%, which can lead to suffocation;
- Too much oxygen, that is, oxygen levels above 23.5%, which increases the risk of fire and explosion ;
- Other flammable and combustible substances greater than a certain percentage (often 10%) of their lower explosive limit (LEL); and
- Toxic substances in concentrations above the occupational exposure limit (OEL) that the

jurisdiction's OHS regulation specifies for the particular substance.

Here's what OHS laws require you to do to control hazardous atmospheres in excavations.

Perform Hazard Assessment

The first thing you must do is determine whether there are atmospheric hazards in excavations at your site before allowing workers to enter them. That may require atmospheric testing where the excavation is deeper than 1.2 metres/4 feet or there are other indications of potential dangers, such as where the excavation is located near a plant that produces toxic chemicals.

Select Appropriate Controls

If you identify atmospheric hazards inside an excavation, you can't allow anybody to enter it unless and until you implement measures to eliminate or minimize the risks. As with most hazards, follow the hierarchy of controls approach in selecting appropriate safety measures.

First Choice: Elimination via Substitution

The best way to protect workers is to not require them to enter excavations that have or potentially have hazardous atmospheres. Consider not carrying out the operation or finding some reasonably practicable way to do it that doesn't require workers to enter the excavation.

Second Choice: Elimination via

Engineering Controls

Unfortunately, substitution won't be an option for most excavation work. If you can't avoid sending workers into excavations, you need to make sure they don't get injured or ill as a result of the air inside. The best solution: Engineer the hazards out of the air so the air they have to work in isn't dangerous. Potential engineering solutions:

- Ventilation, or mechanical systems that force fresh air into the excavation and/or exhaust contaminated air while workers are inside;
- Purging, or introducing substances such as an inert gas, steam or water into an excavation to displace or flush out contaminants before workers enter;
- Introducing an inert (un-reactive) gas such as nitrogen or carbon dioxide to completely displace all oxygen; and/or
- Isolation, or disconnecting, blanking or blinding or using an equivalent engineered system to prevent a hazardous substance contained in adjacent pipelines from seeping or leaking into the space.

Third Choice: Work Controls + PPE

If engineering controls aren't reasonably practicable and you need to send the workers into the excavation knowing that its atmosphere is hazardous, you'll have to use a combination of work controls and respiratory protective equipment to minimize the hazards to acceptable levels. There are 2 basic respiratory protective equipment options for work in hazardous atmospheres:

- Self-contained breathing apparatus respirators; or
- Air-line respirators with emergency escape packs.

In either case, ensure that the equipment you use meets the applicable CSA standards for your province and is properly

used, inspected, maintained and stored.

Work or administrative controls for excavation work in hazardous atmospheres include, at a minimum:

- Implementing or safe work procedures for the operation;
- Ensuring all workers who enter the excavation are aware of the hazards and trained to follow the safe work procedures;
- Posting barriers or warning signs to bar unauthorized entry;
- Having a competent person test the atmosphere before workers enter the excavation and periodically, as necessary, while they remain inside;
- Having appropriate emergency rescue equipment on hand and an [emergency rescue evacuation procedure](#) in place.