WHITE PAPER

Confined Space Entry: Why So Dangerous?

OSHA, the Occupational Safety and Health Administration, defines a confined space as having limited entry and exit points, that is large enough for workers to enter and not intended for regular occupancy. These could include drains, manholes, water mains, sewer systems, crawl spaces, heating, ventilation and air-conditioning systems and attics.

Irrespective of the type of confined space; keeping workers safe within restricted spaces is understandably a concern for organisations worldwide, specifically those in the gas detection industry.

This paper will explore the best ways to do this, and delve a little deeper into why working in these spaces holds so many dangers.

CROWCON
Detecting Gas Saving Lives

Meeting OSHA standards

There are two different types of confined spaces; those that contain hazardous conditions and those that do not contain a physical hazard to the individual. A confined space that contains hazardous conditions can be considered as a permit-required space under the US-defined PRCS regulations. These spaces might be dangerous to the life of the worker if the space hasn't been investigated, tested and controlled.

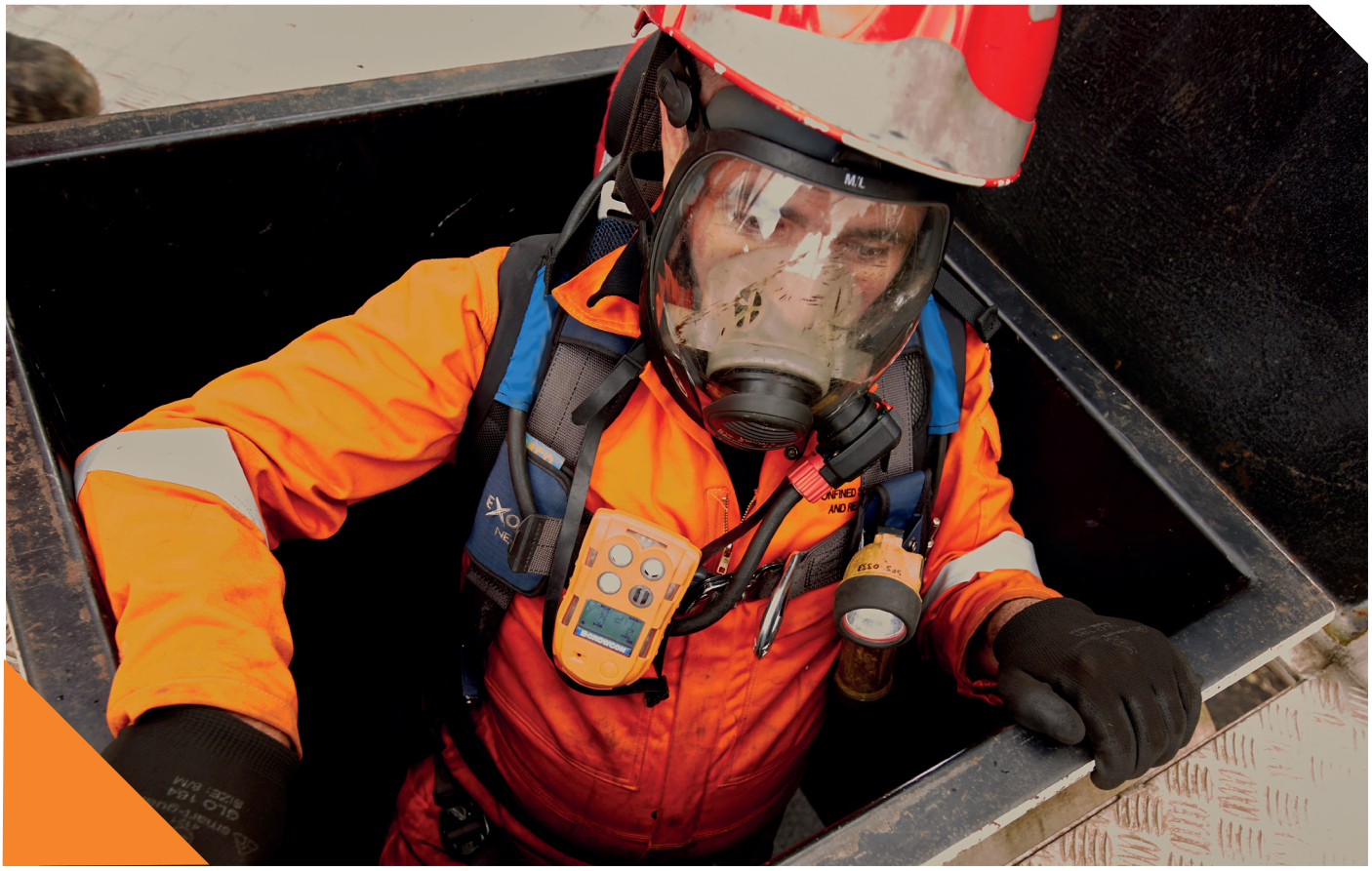
Spaces that tend not to be permit-required confined spaces generally do not contain life threatening hazards. Attics, basements and crawl spaces contain a reduced likelihood of risk, but still fall under the remit of more recent confined entry space regulations.

As an employer you will need to evaluate the space pre-entry, and if hazardous conditions are present, you will be required to create a permit specifying the safety measures and names of those permitted in the space before any work can take place.

Next up, organisations will need to make sure the employees on the ground actually carrying out the gas detection work, who will encounter the confined space during the project, are equipped with all the facts before they enter. Knowing the hazards before starting work, and specifically how to exit in case of an emergency, is important in terms of visibility and worker accountability. There can be signposts erected for entry and exit points if required to assist with this. As an employer, you can also attempt to remove or isolate any hazards that may be present in the space to further protect your workers.

Under the PRCS regulations linked above, the obligation of the employer will depend on what type of employer they are. The controlling contractor is the main point of contact for any information about PRCS on site.

The guidelines expects US-based employers to comprehend which confined spaces their employees are working in, what hazards there are and how these can be made safer by developing comprehensive rescue plans and ensuring staff training.



HSE expectations for confined space entry (CSE)

When managing ,rental fleets data solutions allow you to maximise device uptime and remain aware of which customers have which devices. With a variety of fleets rented out to various companies it has historically been confusing to stay up to date with device calibration due dates and maintenance scheduling requirements.

Now insight data solutions offer those managing rental fleets the chance to sigh a breath of relief due to the increased insights at their fingertips on easy to read and view dashboards. With proactive calibration functionality and device maintenance alerts teams no longer lag behind irrespective of the diversity of rental fleet operations.

Important terms of reference for CSE projects

The host employer is the employer who owns or manages the property where the construction work is taking place.

The controlling contractor is the employer who has overall responsibility for construction at the worksite and the entry employer or sub contractor is any employer who decides that an employee it directs will enter a permit-required confined space.

Checking the area for toxicity pre-entry

Before entering the confined space, as guidelines specify globally, organisations need to know which gases are present in the area. The main way in which to do this with any sort of certainty is by doing a pre-entry check for all the potential gases.

The most common configuration for a multiple-sensor gas monitor is one that can read levels of oxygen, combustible/ flammable gases, hydrogen sulfide and carbon monoxide, since these are the most common dangers from confined spaces.

It is common practice in these area checks for four gas detectors to be calibrated to detect methane as the flammable gas. However, it is worth noting that not every application will have methane present, it could be another flammable gas such as propane, or more commonly, hydrogen, which would mean the device would have to be calibrated according to the target gas required for the environment being entered.

To cover all of the detection requirements in this instance would mean calibrating various devices within a fleet to detect all of the different flammable gases listed above. This is hard to police, as is ensuring workers use the correct detector for the right application.

Utilising a single portable gas detector for confined space entry scoping and exploration work, that can detect all of the main flammable gases present, avoids time consuming and tiresome detection across multiple detectors.

The last thing a worker in this environment needs to worry about is his or her gas detector. Crowcon has designed the T4 with confined space operation in mind to be intuitive and hassle-free.

The T4 portable 4-in-1 detector places safety and ease of use in challenging environments at the fore, so operators can safely concentrate on the task in hand, using just one common, robust device.

The T4 provides protection against carbon monoxide, hydrogen sulphide, flammable gases and oxygen depletion, as well as improved detection of pentane, hexane and other long chain hydrocarbons.

Using one device for all flammable gas applications is crucial in terms of pre-entry safety checks in confined space working. Using devices to detect separate methane, pentane or butane or 19 other flammable gas variants, which are prone to be used in applications where flammable gases are present which are not the device's target gas, can lead to instances where a detector doesn't read correctly. Incorrect device readings in a confined space can have disastrous consequences, leading to a worker carrying out work thinking the area is safe, when it isn't. In the worst circumstances it can lead to fatal explosions.

“Crowcon’s T4 detector comprises a range of new sensors which ensures their robustness.”

Robustness - sensor focus

The importance of having a robust and sturdy gas detection device when working in difficult confined spaces goes without saying. When a device’s robustness is conceptualised in the gas detection industry there can often be a focus on the device’s chassis and internal boards, with less attention given to the sensors. However the sensors are the elements of the detector that interact with the gas first, and so are critical in determining accurate readings and raising the alarm in safety critical situations.

Crowcon’s T4 detector comprises a range of new sensors which ensures their robustness. Five year sensor warranties come with the MPS and LLO2 (long life Oxygen) sensors to provide peace of mind to operators, as well as to demonstrate Crowcon’s confidence in the robustness of the technology.

Using one device in confined space entry environments not only reduces risk considerably, it also improves compliance and proof of compliance. The T4 reliably read’s the %LEL (lower explosive limit) of the environment regardless of the gases present, including in any mix, as well as hydrogen. Knowing that the device in use is proficient in the readings it delivers, helps maintain the safety of the worker in the field, the environment and provides an accurate suite of data to prove compliance when required.

Referred to as the TrueLEL reading, the MPS sensor quickly detects multiple gases simultaneously without the need for in-field calibration. Operators can be confident that the sensors incorporated in the T4 are precise, do not drift and do not require a correction factor, and as a result will swiftly, clearly and correctly inform the user how close the ambient gas levels are to the lower explosive limit (LEL).

Further peace of mind is delivered by the MPS sensor as they cannot be poisoned and require no calibration or bump testing throughout their lifespan, which generally exceeds five years. They are self-monitoring and will automatically alert the user to any malfunction. That spares users the cost of labour, peripherals and downtime.

Due to this, the amount of replacement sensors you use while being able to take devices into traditionally hostile environments which would poison a pellistor, or which would require an expensive IR sensor, will be dramatically reduced.

Furthermore, the MPS sensor improves battery life so devices last longer which enable them to be utilised across multiple shifts, again reducing downtime and the need to oversupply your fleet, leading to lowered costs.

Providing confidence and compliance

Being zone 0 certified enables operators to enter an area in which an explosive gas atmosphere is present continuously or for long periods without fear. This confidence provides operators with the knowledge they can enter spaces and carry out their tasks at hand. This also means that you can have one device across your fleet, with all of them being suitable for Zone 0 applications, without fear that the wrong device is in the wrong zone, ultimately meaning every worker is better protected. This gives teams peace of mind and makes it easier to prove compliance to the confined space regulations.

The MPS and Long Life O2 sensors within the T4 last for five years, and so offer a reduced five year cost of ownership as it is not necessary to replace sensors after three years like the traditional Crowcon T4 and other compliance units on the market.

The included LLO2 (long life oxygen) sensor has the added benefit of improving organisations impact on the environment by preventing 12g of lead being used per device. With this sensor fitted, lead usage is entirely reduced compared to a conventional leaded O2 device. The LLO2 is long life and lead free to ensure Restriction of Hazardous Substances (ROHS) Directive compliance.

This directive originated in the European Union and restricts the use of specific hazardous materials found in electrical and electronic products (known as EEE). All applicable products in the EU market after July 1, 2006 need to pass RoHS compliance. The directive bans lead (Pb), mercury (Hg), cadmium (Cd), hexavalent chromium (CrVI), polybrominated biphenyls (PBB), polybrominated diphenyl ethers (PBDE), and four different phthalates (DEHP, BBP, BBP, DIBP).

Ensuring compliance is important in order to prevent environmental damage and landfill pollution, as well as occupational exposure during manufacturing and recycling. UK based organisations, following the exit from the EU. must now follow different guidelines.

The Dual Tox (CO and H2S) sensor, also found within the T4 only requires replacement every three years and so reduces the cost of maintenance by only having to replace this toxic sensor every three years. When using the Premium T4 with the MPS, LLO2 and Dual Tox sensors fitted you only need to replace one sensor at the end of the third year and the other two at least the end of five years. The implementation of long life sensors significantly reduces the on-going maintenance costs, associated logistics and over-supplying the fleet.

“Using an aspirator is a tried and trusted alternative in the hands of an experienced operator.”

Aspiration best practice

Although a good confined space entry procedure requires the use of a pumped portable detector to check the space is safe to enter, some detectors don’t have pumps built in. In these cases an aspirator should be used. In these instances it’s useful to understand best practice surrounding this process.

Firstly, what is an aspirator?

An aspirator is a manual system for drawing the air through a tube to the sensor. When first starting the aspiration process the initial pressure pulse routinely causes the sensor to trigger an alarm. It can take around a minute for the sensor to normalise and produce a stable reading.

After normalisation, the operator should continue pumping for a period long enough to ensure that sufficient air has been sampled to alert to any immediate danger present. If the space you are entering is deep (specifically in confined spaces), you should sample at different depths to ensure you have tested a representative sample. This can take upwards of 15 minutes.

The rate at which air is pumped over the sensor is important, as well. Pumping too fast or at an irregular pace may cause a pressure pulse and trigger a false alarm. However it is important to ensure you do not pump too slowly as it will mean the gas takes longer to reach the sensor and delay any alarm.

Aspiration issues can also arise if water is accidentally pumped into the sensor. If the end of the tubing is in darkness, it could become submerged in water. Using a water trap avoids this problem by catching the water and allowing the operator to see it before it reaches the sensor. Alternatively, a ball float can be a useful tool as it holds the end of the tubing clear of the water.

If the detector gets wet, it may need testing and recalibrated before being used again

It is important to note that with reactive gases, sampling remotely, whether using an aspirator or motorised pump, is not reliable because the reactive gases (chlorine, ozone, hydrochloride, nitrous oxide, etc) stick to standard tubing. As a result, the sensor will produce a low or no readout. In this case, a detector should be lowered into the space. Once lowered, most gas detectors rely on diffusion so will only test air in the immediate vicinity.

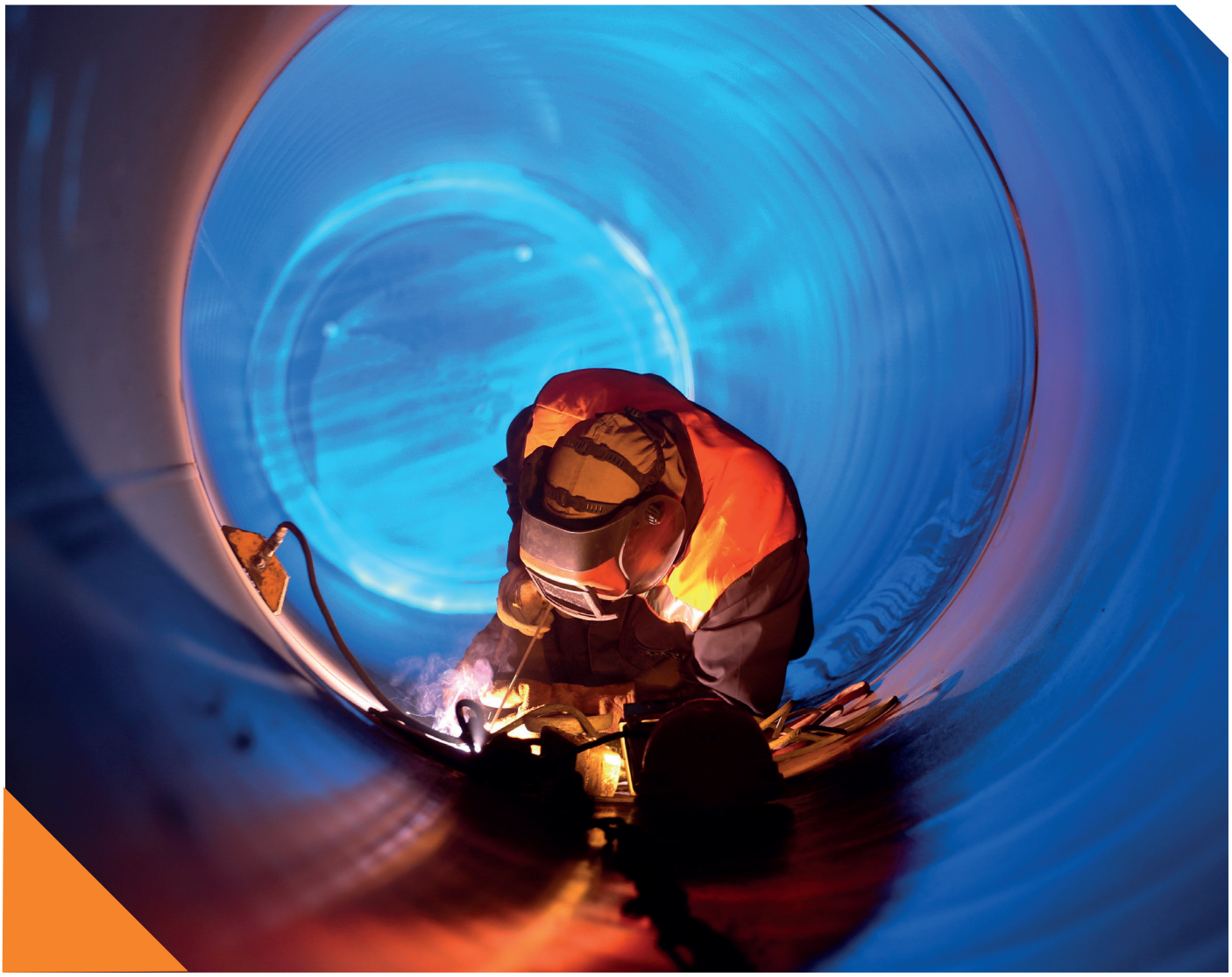
Using a motorised pump is much simpler. It draws air over the sensor at a suitable rate automatically, avoiding false and late alarms, not to mention a tired hand. A motorised pump can sense the increased effort of drawing up water. Its flow-failsafe function would shut the pump down. Nevertheless, using an aspirator is a tried and trusted alternative in the hands of an experienced operator.

Importance of CSE training

Whatever device you are using for gas detection within confined spaces it is crucial to properly train your staff to ensure their ongoing safety, and the safety of the environment. Workers need to be fully aware of the dangers they may encounter and understand any hazards in places where permits are required.

Crowcon is passionate about the importance of training and has held many events with safety education at the fore. People attempting to rescue a confined space worker make up 60% of confined space fatalities. These rescuers are frequently untrained and unaware of the hazards. This shocking statistic illuminates the increased need for rigorous education around confined space entry to avoid accidents and fatalities. It is also helpful to point out that CSE training should be undertaken for all staff, not just those routinely involved in confined space working.

Training should incorporate the properties of different gases and how they behave differently depending on the space they are within, specifically in confined spaces. Operators should understand that different sensor technologies are optimal under different circumstances, and how this feeds into the design and selection of the most appropriate gas detection equipment. Best CSE practice should also be a point of focus for training packages, as well as understanding the broader demands of mounting a safe and effective rescue.



With 50 years experience in the field we are ideally placed to meet your needs, offer peace of mind to you and your team and offer advice and suggestions for effective and secure gas detection within your environment.

Correct equipment

Essentially, having the correct equipment to protect your employees whilst they are working within confined spaces is incredibly important. Before entry, rigorous training should be implemented so that your workforce not only understands the risks associated with the space they will be working in, but also knows how to accurately and efficiently undertake thorough gas detection protocol within the space, as well as how to quickly depart in the event of an emergency.

The MPS, LLO2 and Dual Tox T4 provides peace of mind for organisations with workers operating within dangerous environments, allowing them to protect their employees from hazardous gases in a sustainable, efficient, robust manner.

For more information about the T4 gas detector, or to ask further questions about best practice on confined space entry get in touch today.