

# Workplace Health and Safety Bulletin



## Sewer Entry Guidelines

### Introduction

This Safety Bulletin is designed to help employers, supervisors, contractors and workers understand their responsibilities for health and safety in sewer operations, including the entry of confined spaces such as manholes, vaults and lift stations.

Workers face conditions that may be immediately dangerous to life or health when entering sewer systems for repair or maintenance. Knowledge of the dangers involved, training in safe work procedures and the correct use of safety equipment is essential to ensure that workers are protected during work in sewers.

### Responsibilities

- Where the employer is operating under contract, the owner of the sewer system (or prime contractor if one is appointed) is required to ensure that the employer carries out their responsibilities under Alberta's Occupational Health and Safety (OHS) legislation. The employer is responsible to develop safe work practices, ensure that workers are provided with adequate training on the practices and ensure that the practices are actually followed. The employer must assess hazards at the work site and ensure appropriate controls are in place to protect workers.

**Government of Alberta** ■  
Employment and Immigration

The employer must implement additional specific requirements in the OHS legislation regarding

- hazard assessment,
- confined space entry,
- emergency procedures,
- exposure to harmful substances,
- control of flammability hazards, and
- personal protective equipment.

Workers are responsible for carrying out their work in a manner that does not endanger them or their fellow workers. Workers must cooperate with their employer by following safe work procedures and using the equipment provided to complete the job safely.

## Sewer hazards

Of the various hazards that may be present in sewers, gases and vapours are particularly dangerous because most of them do not have good warning properties (see Table 1). Gases and vapours found in sewers can be toxic, flammable, invisible and are often odourless.

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Table 1 Some common sewer environmental hazards

| Type of Hazard                       | Flammable /Explosive | Odour  | Lighter or Heavier than Air | Action   |
|--------------------------------------|----------------------|--|-----------------------------|--|
| Oxygen deficiency                    | No                   | No   | n/a                         | Asphyxiant   |
| Hydrogen Sulphide (H <sub>2</sub> S) | Yes                  | Yes, rotten egg smell at low concentrations, no odour at high concentrations | Heavier                     | Highly toxic   |
| Carbon Monoxide                      | Yes                  | No   | Almost the same as air      | Asphyxiant, highly toxic   |
| Methane                              | Yes                  | No   | Lighter                     | Asphyxiant   |
| Gasoline vapours                     | Yes                  | Yes, sweet odour   | Heavier                     | Toxic, central nervous system effects, asphyxiant in high concentrations |

\* Note: Elevated or low oxygen levels may affect the accuracy of lower explosive limit (LEL) detectors.

Harmful substances may be released into or found in a sewer system. Chemicals such as gasoline, oil, paint and solvents are sometimes flushed down into the sewer as a means of disposal even though the law does not allow it. Bacteria and viruses capable of causing disease may be present in sewers. Workers must take precautions to avoid exposure. Hazardous conditions can also be created as a result of work done in the sewer such as welding, grinding or cleaning. Cleaning agents may be toxic or can react with residues in the sewer to release toxic substances. As well, used syringes from drug use may be present under sewer covers or in storm drains which could create a biological hazard to workers.

At some concentrations, certain substances can become immediately dangerous to life or health (IDLH). At these levels, even a brief exposure can cause serious permanent health effects or the worker may become dizzy or unconscious and not able to escape. For example, the IDLH level for hydrogen sulphide is 100 ppm. A list of IDLH levels can be found on the U.S. National Institute for Occupational Safety and Health (NIOSH) website at:

 <http://www.cdc.gov/niosh/idlh/idlh-1.html>

## Oxygen deficiency

Oxygen may be displaced by other gases and vapours, creating an oxygen deficient atmosphere. Chemical action may also result in oxygen being used up, e.g. the rotting of organic matter such as sewage by the action of bacteria. Oxygen can also be used up by combustion processes, such as cutting or welding. These can lead to a reduction of the total oxygen content of the air in the sewer to less than the minimum required for performing work. In Alberta, the minimum concentration of oxygen required in a worker's breathing air is 19.5 percent by volume. Below this level, air supplying respiratory protective equipment must be worn. Low oxygen levels cannot be detected by sight or smell - the air must be tested.

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## Hydrogen Sulphide (H<sub>2</sub>S)

A gas commonly found in sewers, H<sub>2</sub>S can be created by the decomposition of organic matter. Concentrations as low as 1 ppm have a characteristic smell of rotten eggs. At concentrations above 100 ppm, the odour of H<sub>2</sub>S may not be detected since the gas deadens the sense of smell.

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Concentrations of H<sub>2</sub>S in excess of 500 ppm will cause unconsciousness in a few seconds.

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Concentrations of H<sub>2</sub>S above 500 ppm can cause unconsciousness in a few seconds. Death quickly follows if the victim is not immediately removed to fresh air.

For more information

 [http://employment.alberta.ca/documents/WHS/WHS-PUB\\_ch029.pdf](http://employment.alberta.ca/documents/WHS/WHS-PUB_ch029.pdf)  
Hydrogen Sulphide at the Work Site

## Carbon Monoxide

Carbon monoxide is a colourless, odourless and toxic gas. It is the product of incomplete combustion and the most common source is the exhaust of gasoline and diesel engines. If such engines must be operated near an open sewer or manhole/entry point, precautions must be taken to ensure that exhaust gases are directed away from the opening.

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Exposure to concentrations exceeding 25 ppm may result in a worker experiencing ringing in the ears, nausea, headaches and sleepiness. The effects become increasingly severe as the concentration and duration of exposure increase. Unconsciousness and death may follow unless immediate rescue is undertaken.

For more information

 [http://employment.alberta.ca/documents/WHS/WHS-PUB\\_ch031.pdf](http://employment.alberta.ca/documents/WHS/WHS-PUB_ch031.pdf)  
Carbon Monoxide at the Work Site

## Methane (Natural Gas, CH<sub>4</sub>)

Fire and explosion are the main dangers associated with methane because it is very flammable. It may be released from a leak in a gas line, but can also be a by-product of backed-up or sluggish sewers. This gas can act as an asphyxiant, displacing oxygen to below the point necessary to maintain life.

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Explosion is the main danger associated with methane.

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## Gasoline vapours

Gasoline is sometimes found in both sanitary and storm sewers. It may enter from leaking underground storage tanks, inadvertent spillage, or illegal disposal. Gasoline vapours, even in small amounts, can be a fire and explosion hazard.

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Gasoline vapour is also a respiratory irritant and acts as an anaesthetic agent when inhaled. The most common physical effects from exposure are symptoms of intoxication, headaches, blurred vision, dizziness and nausea. Concentrations exceeding 2,000 ppm are intoxicating within 5 to 10 minutes.

## Fire hazards

Fires and explosions in confined spaces are often caused by gases or vapours igniting. Two or more chemicals can also react together and become explosive or generate flammable vapours. Flammable materials that may be present in sewers include gases (methane, hydrogen sulphide) and vapours (solvents, gasoline) or may be present as a result of work being done in the area, e.g. acetylene gas used for cutting.

For a fire or explosion to occur, fuel, oxygen and an ignition source (heat) must be present in the right properties.

For more information



[http://employment.alberta.ca/documents/WHS/WHS-PUB\\_fex002.pdf](http://employment.alberta.ca/documents/WHS/WHS-PUB_fex002.pdf)

Handling and Storage of Flammable Materials at the Work Site

## Biological hazards

The potential for illness resulting from contact with viral, bacterial, or parasitic microorganisms in sewage is real, but reasonably limited. For those workers exposed to sewage, the most serious viral risk is hepatitis and the most serious bacterial risk is tetanus. Intestinal parasites have never been identified as a problem for workers exposed to sewage who follow safe work practices. Medical sharps, such as syringes, may be found under sewer entry covers and in storm drains. These waste materials have been identified as a hazard to workers.

For more information

 [http://employment.alberta.ca/documents/WHS/WHS-PUB\\_mg012.pdf](http://employment.alberta.ca/documents/WHS/WHS-PUB_mg012.pdf)  
Monitoring of Workers Exposed to Sewage

 [http://employment.alberta.ca/documents/WHS/WHS-PUB\\_mg024.pdf](http://employment.alberta.ca/documents/WHS/WHS-PUB_mg024.pdf)  
Immunizations of Occupational Exposures Workers

## Physical hazards

### Slips, trips and falls

Sewers are usually entered via manholes and a ladder or rungs in the wall are used for ascending or descending. Workers may be at risk for falling while getting into the space as well as when they are inside. In addition, since sewers are wet environments, the floors, walls and rungs of the ladder may be very slippery.

In pumping stations/rooms, cluttered materials may create a tripping hazard.

### Falling objects

There may be a danger of being struck by falling objects, such as tools or equipment, particularly if the sewer access port is located above workers.

## Electrical shock

Electrical shock can result from defective extension cords, welding cables or other electrical equipment. Work done in wet conditions can be particularly dangerous. Ground fault circuit interrupters (GFCIs) or double insulated equipment should be used where there is a danger of electrical shock.

## Substances entering through piping

Sewer lines or associated connected piping can contain liquids, toxic gases or other harmful substances. If these substances enter the sewer where workers are working, hazardous and life threatening conditions can be created. Where possible, workers should be isolated from piping. If pressurized, the requirements of Part 15 of the OHS Code may be applicable. If it is not possible to “isolate” the sewer area where the work is being done, equipment and procedures must be in place to protect workers from these hazards.

## Poor visibility

Poor visibility increases the risk of incidents and makes it harder for a standby person to see a worker who may be in distress. Portable lighting may be required to ensure that lighting levels are adequate. Lighting units used in such settings must be “explosion-proof”.

## Noise

Noise created in a sewer can be particularly harmful due to reflecting off the walls. Noise levels from a source inside a sewer can be up to 10 times greater than the same source located outdoors. If work that generates noise, such as cutting, grinding or welding must be done inside, monitoring is required to ensure that workers are not exposed to noise levels exceeding the limit stated in the OHS Code. If noise levels cannot be reduced, workers may be required to use hearing protection.

## Drowning

It is usually not possible to fully drain or dry a sewer prior to entry. Spaces that are not fully drained or dry pose a risk of drowning. It takes relatively little standing water or other liquid to create a drowning hazard. For example, insufficient oxygen or the presence of a toxic material can make a worker unconscious. Workers who have fallen face down into a small pool of water have drowned.

## Confined space entry

Entry into a sewer is considered a confined space entry. Alberta's OHS Code, Part 5 — Confined Spaces, requires that an employer develop a code of practice for entry into and work within confined spaces.

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For more information

 [http://employment.alberta.ca/documents/WHS/WHS-PUB\\_cs001.pdf](http://employment.alberta.ca/documents/WHS/WHS-PUB_cs001.pdf)  
Guideline for Developing a Code of Practice for Confined Space Entry

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The written work procedure, as part of the code of practice required for confined space entry, must be available to all supervisors and workers involved in sewer entry.

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The employer must establish a written work procedure for sewer entry to be followed every time a sewer manhole, pumping station or vault is entered. A copy of the written work procedure must be provided to all supervisors and workers involved in sewer entry.

The safe work procedure usually consists of three parts:

- (1) pre-entry planning — before entry is commenced;
- (2) entry procedures — for entry into, working within and leaving the confined space; and
- (3) rescue procedures — planning for emergency situations.

## Pre-entry planning

A hazard assessment must be done prior to each sewer entry. It must be verified when workers arrive at the work site as actual site conditions may be different or have changed since the initial assessment was done. The sample checklist in Appendix A can be used to assist with the hazard assessment process.

## Work procedures

- (1) Ensure a valid entry permit is obtained.
- (2) Secure the site — erect signs, barricades and other traffic control devices required to ensure workers are protected from traffic. Ensure that there is an adequate warning system for oncoming traffic.
- (3) Ensure that all necessary equipment is at the site and ready for use, e.g. test equipment, fall protection equipment, communication devices, lighting and all rescue equipment.
- (4) Perform a pre-entry test/assessment of the atmosphere. Appropriate respiratory protective equipment may be needed to protect workers performing this task.
- (5) Ensure that atmospheric hazards present in the sewer are identified and controlled.
  - Where practical, ventilate the space to remove harmful substances and maintain an adequate oxygen content.
  - Where ventilation is not practical or may not be effective, a competent worker must carry out tests to determine whether or not the atmosphere is safe for entry. Tests must also be repeated periodically while the work is being carried out to determine whether oxygen levels are adequate, airborne contaminants are below their Occupational Exposure Limits (OELs) and the atmosphere is free of explosive gases. Continuous monitoring may be required. For more information, see Appendix B.
- (6) If the sewer atmosphere is found to contain harmful substances or is oxygen deficient, ensure that workers required to enter are:
  - protected by using appropriate respiratory protective equipment;
  - attended by, and in communication with, another worker stationed at or near the entrance of the confined space;
  - provided with, and understand, rescue procedures;
  - protected by appropriate rescue equipment available for immediate use;
  - aware of, and familiar with, the employer's code of practice for confined space entry; and
  - physically capable of effecting a rescue.

- (7) Isolate the space where the work is to be carried out or follow procedures that ensure that workers are protected from harmful substances that may enter the work area.
- (8) Check for physical hazards in the sewer where the work will be carried out, e.g. broken access rungs, cracked walls, deep or fast-flowing effluent.
- (9) If “hot work” such as welding is to be carried out, perform tests to confirm the absence of a flammable substance in the atmosphere before the work is started and continuously during the work process. A hot work permit must be issued by the supervisor responsible for ensuring it is safe to carry out the hot work involved.
- (10) Ensure that all workers know what procedures to follow in case of an emergency situation.

## Rescue procedures and equipment

Emergency rescue procedures must be prepared and understood before any worker enters a sewer. The employer must ensure that a worker does not enter or remain in a confined space unless an effective rescue can be carried out. The emergency response plan must include procedures to evacuate the confined space when

- (a) an alarm is activated,
- (b) the oxygen content drops below 19.5% by volume or exceeds 23.0% by volume, and
- (c) there is a significant change (more than 10%) in the concentration of a hazardous substance in the space.

The emergency response plan must include the following elements:

- (a) identification of potential emergencies;
- (b) procedures for dealing with identified emergencies;
- (c) identification of the location and operational procedures for emergency equipment;
- (d) training requirements for emergency response;
- (e) location and use of emergency facilities;
- (f) fire protection requirements;
- (g) alarm and emergency communication requirements;
- (h) first aid services required;
- (i) procedures for rescue and evacuation; and
- (j) designated rescue and evacuation workers.

Speed is critical in rescue situations. It is important to have sufficient equipment and well trained personnel on hand to successfully effect a rescue. The more difficult and hazardous the rescue is likely to be, the more detailed and sophisticated the pre-planning should be.

See Appendix C for details on “Rescue Procedures”

## Sewer worker’s guidelines

Workers required to enter sewer systems are responsible for carrying out their work in a way that will not endanger themselves or other workers. They must co-operate with their employer by using equipment correctly, following safe work procedures and reporting defective equipment.

Workers should check for and be aware of the following:

Has a hazard assessment been completed for the sewer entry?

- Have you been involved with the hazard assessment? If no, have you reviewed it?
- Are you aware of the hazards related to the sewer environment and work being done?

Have you received training for entry into confined spaces?

- Have you reviewed the codes of practice for entry into confined spaces and respiratory protective equipment that your employer is required to prepare?
- Have you reviewed the procedures related to control of exposure to harmful substances or other hazards?

Is the necessary equipment available and being used?

This includes:

- Traffic control and warning devices such as barricades and signs
- Personal protective equipment such as coveralls, gloves, hard hat, full body harness and respiratory protective equipment
- Ventilation equipment such as an air blower and hoses

- Air monitoring equipment for toxic or flammable gas detection and oxygen level indication
- Rescue equipment such as a tripod and hoisting device

Is there a safe means of entry and exit?

- Are there rungs inside the manhole? Are they in good condition?
- Is a ladder necessary?
- Is a suitable ladder available?

Is the air inside the sewer safe to breathe?

- Is ventilation equipment being used in accordance with the procedures you are to follow?
- Have all atmospheric tests required by your safe work procedure been completed? What do the results indicate?

Will respiratory protective equipment be necessary?

- Have you been fit tested for the equipment required for the entry?
- Are you able to obtain a good fit and airtight seal?

If it is necessary, is the appropriate respiratory protective equipment available and ready for use?

- Has adequate training been provided in the use of the type of respiratory protective equipment that you are required to use? Do you know how to use it properly?
- Do you know how to check that respiratory protective equipment is working properly before you have to use it?
- Can you don the respiratory protective equipment properly, getting a good, airtight seal?

Are rescue procedures in place?

- Do you know what the rescue procedures are?
- Is the necessary equipment in place and ready for use?
- Do you know your role in the event of an emergency situation?

## Employer guidelines

The employer has overall responsibility for the health and safety of all workers present at the work site, whether they work directly for them or not. Where the employer is operating under contract, the owner of the sewer system is required to ensure the employer carries out their responsibilities for the health and safety of workers at the site.

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There are three main areas of responsibility that the employer is required to deal with:

- (1) *The Worker* — any worker entering a sewer must be competent. For example, the worker must be adequately qualified, suitably trained and have enough experience to carry out the work safely, or must be under the direct supervision of a competent worker. The employer must ensure that all workers who enter a sewer are aware of the hazards they may encounter as well as how to recognize and deal with them. Workers must also be trained in the entry procedures and the use of safety equipment necessary for the job.
- (2) *The Equipment* — the employer is required to ensure that all equipment necessary to protect the health and safety of workers is available at the work site, is in good working condition and that workers use it. Workers must be trained in the correct use of the equipment, its maintenance requirements and limitations.
- (3) *The Environment* — any hazards associated with sewer entry must be identified and brought to the attention of workers. If a harmful substance is present in the air, the employer is required to take all reasonable steps to either reduce the concentration to below the OEL or supply appropriate respiratory protective equipment.

In addition, the employer must

- (a) ensure that a hazard assessment is completed prior to the entry. Workers must be involved in the hazard assessment process,
- (b) prepare codes of practice for confined space entry and respiratory protective equipment,
- (c) ensure that an entry permit system is in place, and
- (d) ensure that a emergency response plan has been completed that includes the elements specified in Part 7 of the OHS Code.

## Sample Sewer Entry Hazard Assessment Checklist

|   | Yes  | No   |
|---|--|--|
| Is it absolutely necessary to enter the sewer to complete the work?   | <input type="checkbox"/>   | <input type="checkbox"/>   |
| Will traffic control be a factor?<br>If yes, what traffic control devices will be needed?<br><br>_____<br><br>_____<br><br>_____<br><br>_____   | <input type="checkbox"/>   | <input type="checkbox"/>   |
| Has this sewer been recently entered?<br>If yes, were any problems encountered previously?<br><br>_____<br><br>_____<br><br>_____<br><br>_____  | <input type="checkbox"/>   | <input type="checkbox"/>   |
| Are there businesses or industries nearby that may use or dispose of chemicals or fuels?<br>If yes, identify substances of concern:<br>Fuels (gasoline, diesel, natural gas)<br>Solvents<br>Other<br><br>_____<br><br>_____<br><br>_____<br><br>_____ | <input type="checkbox"/>   | <input type="checkbox"/>   |
| What job tasks are being carried out in the sewer?<br><br>Inspection<br>Welding<br>Cutting<br>Grinding<br>Use of solvents, corrosive chemicals or cleaners  | Yes <input type="checkbox"/> No <input type="checkbox"/><br>Yes <input type="checkbox"/> No <input type="checkbox"/> | Yes <input type="checkbox"/> No <input type="checkbox"/><br>Yes <input type="checkbox"/> No <input type="checkbox"/> |

|  | Yes                          | No                          |
|--|------------------------------|-----------------------------|
| Use of paint/spray painting  | Yes <input type="checkbox"/> | No <input type="checkbox"/> |
| Sandblasting   | Yes <input type="checkbox"/> | No <input type="checkbox"/> |
| Repairs  | Yes <input type="checkbox"/> | No <input type="checkbox"/> |
| Other  |                              |                             |
| _____  |                              |                             |
| _____  |                              |                             |
| _____  |                              |                             |
| _____  |                              |                             |
| _____  |                              |                             |
| What tests are needed to ensure that the air in the sewer is safe? |                              |                             |
| Oxygen concentration   | Yes <input type="checkbox"/> | No <input type="checkbox"/> |
| Hydrogen sulphide concentration                                    | Yes <input type="checkbox"/> | No <input type="checkbox"/> |
| Carbon monoxide concentration                                      | Yes <input type="checkbox"/> | No <input type="checkbox"/> |
| Lower Explosive Limit (LEL)  | Yes <input type="checkbox"/> | No <input type="checkbox"/> |
| Other  |                              |                             |
| _____  |                              |                             |
| _____  |                              |                             |
| _____  |                              |                             |
| _____  |                              |                             |
| _____  |                              |                             |
| If contaminants are present, what special precautions are needed?  |                              |                             |
| _____  | Yes <input type="checkbox"/> | No <input type="checkbox"/> |
| _____  |                              |                             |
| Engineering controls   |                              |                             |
| _____  | Yes <input type="checkbox"/> | No <input type="checkbox"/> |
| _____  |                              |                             |
| Administrative controls  |                              |                             |
| _____  | Yes <input type="checkbox"/> | No <input type="checkbox"/> |
| _____  |                              |                             |
| Personal protective equipment                                      |                              |                             |
| List all required  |                              |                             |
| _____  |                              |                             |
| _____  |                              |                             |
| _____  |                              |                             |

|   | Yes  | No   |
|---|--|--|
| Will it be possible to isolate the work space?<br>If no, what special precautions will be taken?<br>_____<br>_____<br>_____<br>_____<br>_____   | <input type="checkbox"/>   | <input type="checkbox"/>   |
| Are there procedures/precautions in place for biological hazards?<br>If yes, list<br>_____<br>_____<br>_____<br>_____<br>_____  | <input type="checkbox"/>   | <input type="checkbox"/>   |
| Will special equipment be needed for this entry?<br>If yes, indicate types:<br>Explosion-proof electrical equipment<br>Pumps<br>Non-sparking tools<br>Fans/ventilation equipment<br>Full body harnesses<br>Tripod and winch<br>Other<br>_____<br>_____<br>_____<br>_____<br>_____ | Yes <input type="checkbox"/> No <input type="checkbox"/><br>Yes <input type="checkbox"/> No <input type="checkbox"/> | Yes <input type="checkbox"/> No <input type="checkbox"/><br>Yes <input type="checkbox"/> No <input type="checkbox"/> |
| What rescue equipment will be required?<br>List all:<br>_____<br>_____<br>_____<br>_____<br>_____   |  |  |

|  | Yes                      | No                       |
|--|--------------------------|--------------------------|
| Has the weather office been contacted regarding storm or flash flood conditions or other weather conditions that could cause a hazard?<br>If yes, identify | <input type="checkbox"/> | <input type="checkbox"/> |
| _____  |                          |                          |
| _____  |                          |                          |
| _____  |                          |                          |
| _____  |                          |                          |
| _____  |                          |                          |

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## Ventilation, Air Monitoring and Isolation Techniques

### Ventilation procedures and equipment

Key hazards in a sewer are asphyxiating, toxic and/or explosive atmospheres. The best protection against these hazards is well-designed, efficient ventilation of the work space. Ventilation can also be used to control extreme temperature conditions and reduce other discomforts such as unpleasant smells.

### Equipment

Powered blower equipment must be used. Natural ventilation techniques relying on winds or thermal drafts are not dependable and not recommended for ventilating confined spaces.

Ensure the blower is supplying the work space with fresh, clean air — do not place the air intake near vehicle exhausts or where contaminants could be picked up from another area.

### Procedures

Proper ventilating procedures for a sewer require air to be blown through hoses to the furthest limits of the work area. This method reduces the risk of a build-up of hazardous gases in the space. The amount or duration of ventilation required depends upon site conditions and must be determined by testing the atmosphere until it is safe for workers to enter.

Ventilation must continue until:

- (a) the oxygen content of the air is between 19.5 and 23 percent by volume;
- (b) the concentrations of toxic contaminants are below their OELs; and
- (c) the concentrations of flammable contaminants are below their lower explosive limits.

## Testing the atmosphere

The sewer atmosphere must be tested before a worker enters and on a regular basis after entering:

- (a) when ventilation is not practical;
- (b) when ventilation may not be effective;
- (c) while ventilating the sewer to remove of a harmful substance; and
- (d) before commencing and during any “hot work” procedures.

Accurate testing requires that:

- (a) the appropriate instrument is used properly, and is maintained and calibrated according to the manufacturer’s specifications;
- (b) the person doing the testing is competent to do so;
- (c) the testing is carried out in the proper locations;
- (d) an accurate picture of the work environment is obtained by testing at various levels to detect gases that may be lighter or heavier than air and to locate areas where gases may be trapped; and
- (e) test results are recorded.

Testing confirms that the oxygen content remains within acceptable limits and that a buildup of harmful substances including explosive gases is avoided. All tests must be carried out by a competent worker. If the worker is required to enter the sewer to conduct the tests, the worker must be protected by the use of appropriate respiratory protective equipment.

## Testing equipment

Four types of detection tests are required to ensure a safe atmosphere in a sewer:

- (1) *oxygen level indication* — to determine the oxygen content of the air;
- (2) *combustible gas vapour detection* — explosive gases such as methane and vapours such as gasoline;
- (3) *toxic gas detection* — toxic gases such as H<sub>2</sub>S and carbon monoxide; and
- (4) *other air monitoring (as required)* — to detect other hazardous gases or vapours.

When performing atmospheric tests, the concentration of oxygen is usually measured first. Many of the sensors used in test instruments require oxygen to operate properly and will give inaccurate results if they are used in oxygen deficient atmospheres.

Many different types of test equipment are available. Some are automatic, with built-in alarms, and others require manual operation. All require competent personnel to operate them properly. The selected equipment must be approved for use in explosive atmospheres.

Although some detection devices are capable of performing two or three different tests, most are dedicated to the detection of a particular hazard.

## Isolation techniques

To prevent harmful substances from entering the work space, pipes feeding into the work area can be isolated by blanking or blinding.

If the work area contains moving equipment parts such as paddles, drives, etc., the equipment must be locked out, or otherwise rendered inoperative to prevent accidental re-activation.

Readers should refer to Part 15 of the OHS Code and the OHS Code Explanation Guide for requirements specific to isolation and locking out.

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## Rescue Procedures

Emergency rescue procedures must be planned and prepared whenever there is the possibility of an emergency that may require rescue or evacuation. This includes circumstances when an alarm is activated, when oxygen concentrations drop below 19.5% by volume or exceed 23.0% by volume or there is a significant change in the concentration of hazardous substances inside the sewer. The rescue procedures must be in place prior to a worker entering the manhole, sewer or vault.

### Communication and alert

Whenever the sewer atmosphere contains or may contain a harmful substance, or has an atmosphere deficient in oxygen, a worker must be stationed at or near the entrance to the confined space and must be in direct communication with those inside the confined space. Communication between the tending worker and other rescue personnel is also necessary as a means of immediately notifying medical personnel.

### Rescue personnel

- Designated workers must be trained and ready to assist in a rescue situation.
- Rescuers must be trained in appropriate response procedures as well as first aid and cardio pulmonary resuscitation (CPR) techniques.
- A rescue co-ordinator should be designated to take control in an emergency situation.
- To ensure competency of rescue personnel, exercises that simulate potential emergencies must be performed on a regular basis.

### Rescue equipment required at the site

- A tripod and full body harness system, or some other way of maneuvering the victim to the surface, will be required.
- A basket stretcher, or similar device, should be available for moving the victim to emergency transportation.
- Sufficient, appropriate respiratory protective equipment to protect rescue personnel must be at the site. Ensure that rescue workers can physically enter the area while wearing their respirators. Rescue workers must not enter the sewer unless they are properly protected.
- Appropriate and adequate first aid equipment must be immediately available.

## Emergency transportation

- According to Part 11 of the OHS Code, appropriate transportation to the nearest health care facility must be provided for injured workers.
- The nearest hospital or health care facility should be notified by telephone and provided with full information on the circumstances of the injury including any exposure to toxic substances, so that appropriate preparations can be made prior to the arrival of the injured worker.

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## Personal Protective Equipment

### Respiratory protective equipment

Workers may be exposed to health hazards caused by dusts, chemicals or an oxygen deficient atmosphere. The employer is required to minimize these hazards through the use of engineering controls such as ventilation. When the hazards cannot be reduced sufficiently, then respiratory protective equipment is needed.

There are a some situations where the use of respiratory protective equipment is the best or only way to protect workers such as during an emergency rescue. To provide effective protection, respiratory protective equipment must be carefully selected to meet the requirements of the job. In choosing the equipment, consider the size of the entryway. Some types of self-contained breathing apparatus may make entry and exit awkward or impossible.

Respiratory protective equipment must be properly maintained and used to provide complete worker protection. Workers who use the equipment must be fit tested.

For more information



[http://employment.alberta.ca/documents/WHS/WHS-PUB\\_ppe001.pdf](http://employment.alberta.ca/documents/WHS/WHS-PUB_ppe001.pdf)

Respiratory Protective Equipment – Employer’s Guide – PPE001



[http://employment.alberta.ca/documents/WHS/WHS-PUB\\_ppe004.pdf](http://employment.alberta.ca/documents/WHS/WHS-PUB_ppe004.pdf)

Guidelines for the Development of a Code of Practice for Respiratory Protective Equipment – PPE004



[http://employment.alberta.ca/documents/WHS/WHS-PUB\\_mg005.pdf](http://employment.alberta.ca/documents/WHS/WHS-PUB_mg005.pdf)

Medical Assessment of Fitness to Wear a Respirator

## Other personal protective equipment

Other types of personal protective equipment that may be necessary for the safety of workers entering a sewer system include:

- liquid repellent coveralls
- hard hats
- liquid repellent gloves
- protective footwear (boots)
- full body harness
- lifeline
- eye protection (goggles, splash-proof eye/face shields)
- hearing protection

The employer must determine the best way to protect workers at each specific work site.

Current to February 2010

## Contact us:

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### Province-Wide Contact Centre

 Edmonton & surrounding area:  
780-415-8690

 Throughout Alberta:  
1-866-415-8690

 Deaf or hearing impaired

- In Edmonton: **780-427-9999**

or

- **1-800-232-7215**  
throughout Alberta

### Web Site

 [www.worksafe.alberta.ca](http://www.worksafe.alberta.ca)

## Getting copies of OHS Act, Regulation & Code:

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### Queen's Printer

 [www.qp.gov.ab.ca](http://www.qp.gov.ab.ca)

 Edmonton 780-427-4952

### Workplace Health and Safety

 <http://employment.alberta.ca/whs-ohs>

Call any Government of Alberta office toll-free  
Dial 310-0000, then the area code and telephone number you want to reach

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