

PURPOSE/APPLICATION

There is a variety of flammable substances to be found in the workplace. They range from the obvious, (e.g. gasoline, paint thinners, welding gases and heating fuels), to the not so obvious, (e.g. packaging materials, dusts from woodworking and dusts from food such as flour and sugar).

The fire triangle typically identifies three sides to sustain a fire: a fuel at the right concentration, a good supply of air, and a source of ignition. If you control these elements, fires can be prevented.

Workers who are required to handle, use, store, produce or dispose of flammable substances will be trained on the contents and the safe work practice.

PPE

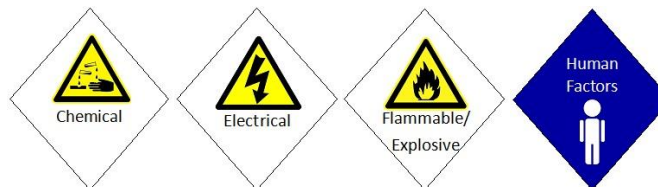
- CPES minimum requirements
- Additional PPE as determined by the MSDS and / or hazard assessment

TRAINING

- WHMIS

HAZARDS & CONCERNS

- Fire
- Explosive atmosphere
- Electrical
- Chemical
- Personal injury
- MSDS



PRECAUTIONS

- When a flammable gas or a flammable liquid is handled, used or stored, all sources of ignition must be eliminated or adequately controlled including open flame, spark-producing mechanical equipment, welding and cutting processes, smoking, static discharge and any electrical equipment or installation that is not approved for hazardous locations, as specified by the Electrical Safety Act.
- Metallic or conductive containers used to transfer flammable liquids must be electrically bonded to each other or electrically grounded while their contents are being transferred from one container to the other.
- Except for packaging used to contain flammable or combustible liquids, combustible shelves, racks and other materials are not permitted inside a flammable or combustible liquids storage room or storage cabinet unless required as part of a fire separation.
- Materials contaminated by flammable liquids are to be placed in receptacles that:
 - are non-combustible and have close-fitting metal covers;
 - are labeled "flammable";
 - and are located at least one meter away from other flammable liquids.

- Combustible and flammable liquids are to be kept in receptacles that meet the requirements of the National Fire Code of Canada 1990, including any Revisions and Errata published from time to time, respecting the storage of flammable and combustible liquids.
- When working with or near flammable and combustible liquids, ensure an appropriate classed fire extinguisher (typically BC) is readily available.
- If a worker's clothing/and or skin is contaminated with a flammable or combustible liquid, the worker must:
 - (a) avoid any activity where a spark or open flame may be created or exists,
 - (b) remove the clothing and,
 - (c) ensure the clothing is decontaminated before it is used again. If a worker's skin is contaminated the worker must wash the skin at the earliest possible time.
- Workers are not permitted to enter a work site where a flammable or explosive atmosphere of a work site is at a level that is more than 10% of the lower explosive limit. Atmospheric testing results must be assessed before a worker enters.
- A worker who operates a vehicle that contains a flammable liquid, gas, or an explosive substance, shall ensure that the engine of the vehicle is shut off during the connection or disconnection of the lines for the loading or unloading of the flammable liquid, gas or explosive substance.
- No worker shall undertake any servicing or maintenance of a vehicle while a flammable liquid or gas or an explosive substance: is loaded into or unloaded from the vehicle; or is present in the vehicle in any place other than the fuel tank.
- Gasoline is not to be used to start a fire or used as a cleaning agent.
- If an internal combustion engine is located in a hazardous location, ensure it has a combustion air intake and exhaust discharge that are:
 - (a) equipped with a flame arresting device, or
 - (b) located outside the hazardous location.

REFERENCES / ADDITIONAL INFORMATION

Apply the following five principles to making sure that you are working safely with flammable substances.

- 1. Ventilation** - Ensure there is plenty of fresh air where flammable liquids or gases are stored and used. Good ventilation will mean that any vapours given off from a spill, leak, or release from any
- 2. Ignition** - Remove sources of ignition from the storage and handling areas. Ignition sources can vary, and they include sparks from electrical equipment or welding and cutting tools, hot surfaces, open flames from heating equipment, smoking materials and even static electricity. If the work requires that the contents of metallic or conductive containers be transferred from one to another, ensure that static electricity is controlled, by grounding or bonding, while the contents are being transferred.
- 3. Containment** - Ensure flammable substances kept in suitable containers that have been CSA or ULC approved. If there is potential for a spill, ensure the product will be contained and prevented from spreading to other parts of the working area. Use of lidded containers and spillage catch trays, for example, can help to prevent spillages spreading. Also, do not store flammable

substances that may be of sufficient quantity to produce an explosive atmosphere if inadvertently released.

4. **Exchange** - If possible, exchange a flammable substance for a less flammable one or eliminate flammable substances from the process altogether.
5. **Separation** - Ensure that flammable substances stored and used well away from other processes and general storage areas. Separate them by a physical barrier, wall or partition. Also ensure that flammable substances are not stored within 30 meters of an underground shaft, are not stored in the immediate vicinity of the air intake of ventilation supply system, an internal combustion engine, or the fire box of a fired heater or furnace. Separating your hazards in this manner will contribute to a safer workplace.

Specific Materials

The following sections deal with specific types of flammable substances. The precautions mentioned need to be considered in addition to the five principles described above.

Flammable Liquids

Flammable liquids can give off large volumes of flammable vapours at room temperature. These vapours, when mixed with air, can ignite, often violently. Spilled flammable liquids can, if not contained, flow a long way to an ignition source, and then flash back to the source of the leak. Spills on clothing can represent a serious risk of injury if ignited. To help control these risks:

- store flammable liquids in a separate storage area, or in a purpose-made bin or cupboard;
- dispense and use them in a safe place where there is good ventilation and no source of ignition;
- keep containers closed when not in use. If possible, use safety containers which have self-closing lids;
- dispense liquids over a tray and keep some non-flammable absorbent material handy to mop up spills;
- dispose of contaminated materials safely or call in disposal experts.

Flammable Dusts

Finely divided flammable dusts dispersed in the workplace atmosphere can, if ignited, explode violently and cause a lot of damage. If you handle flammable dusts you need to remember the following:

- keep plant dust-tight;
- keep the working area dust-free by regular cleaning, and vacuuming spillages as they occur;
- some dust handling plant has special safety features built in. The purpose of these needs to be properly understood, and they should be maintained in good working order.

Flammable Solids

Some types of plastic foam, packaging materials, polyester wadding and textiles will ignite easily and burn fiercely, giving off a lot of dense black smoke. Remember:

- do not store these materials close to heaters or electrical equipment which could run hot and act as a local ignition source;

- make sure that gangways and exits from storage and working areas are kept clear of packaging materials, finished products containing flammable solids etc. In the event of fire, gangways and exits could become obscured by smoke, so the easier they are to find, the better.

Flammable Gases

Gases in cylinders are often stored at very high pressures, and so their uncontrolled release can be physically dangerous. A small amount of released gas can fill a large area with a potentially explosive mixture. This is particularly true of liquefied gases such as LPG. The following points need to be considered:

- stored cylinders need to be suitably restrained and their valves protected from impact damage;
- gas cylinders may need special valves, fittings and hoses. Always check the manufacturers' or suppliers' instructions and fit the correct equipment;
- protect hoses from potential causes of damage that could cut, scuff or weaken them. Examine them regularly and replace them if they show signs of damage or wear that could give rise to a leak.

Oxygen

Although oxygen is necessary for life and is an essential ingredient in controlled burning, such as in a gas fire or oxy-fuel gas welding and cutting, its misuse can lead to serious consequences. Materials that ordinarily will burn only slowly will burn very vigorously in an oxygen-enriched atmosphere. Others such as greases and oils may burst into flames in this kind of atmosphere. As well as the precautions outlined above for flammable gases, the following points should be remembered:

- never use oxygen instead of compressed air;
- never use oxygen to sweeten the air in a working area or confined space;
- never use grease or oil on equipment containing oxygen.

Reactive Chemicals

Some products contain chemicals, such as organic peroxides, which can explode if they are not stored and handled correctly. Other substances can react vigorously with incompatible materials or contaminants. For example, oxidising chemicals can cause flammable materials to ignite, and some substances, such as sodium, react violently with water and can ignite. The following points need to be considered:

- storage and process temperatures may need to be carefully controlled to prevent dangerous decomposition or reaction;
- check labels and safety data sheets for physical properties and incompatibility with other materials.

Emergencies

When working with flammable substances, there is the potential for something to go wrong, the following additional precautions should be considered:

- ensure that appropriate first aid providers and supplies are readily available
- ensure that firefighting equipment is available, and personnel have been trained in the use of the equipment

- If it is not practicable to maintain the airborne concentration of a flammable gas or vapour below the applicable exposure limit, for example, in a temporary situation or an emergency,
- only the minimum number of workers necessary for the work may be exposed,
- every worker exposed must be adequately trained and equipped to safely perform the required duties
- the concentration of the flammable gas or vapour must not exceed 10% of the lower explosive limit (LEL), and
- in a life-threatening emergency only, exposure of emergency response workers is permitted above 20% of the LEL, provided that only those qualified and properly trained and equipped workers necessary to correct the unsafe condition are exposed to the hazard and every possible effort is made to control the hazard while this is being done.

REGULATIONS

Alberta OHS Code – Part 10 Fire and Explosion Hazards

Prohibitions

162(1) *A person must not enter or work at a work area if more than 20 percent of the lower explosive limit of a flammable or explosive substance is present in the atmosphere.*

162(2) *Subsection (1) does not apply to a competent, properly equipped worker who is responding in an emergency.*

162(3) *A person must not smoke in a work area where a flammable substance is stored, handled, processed or used.*

162(3.1) *A person must not use an open flame, except in accordance with section 169, in a work area where a flammable substance is stored, handled, processed or used.*

162(4) *A person must not mix, clean or use a flammable or combustible liquid at a temperature at or above its flash point in an open vessel if a potential source of ignition is in the immediate vicinity of the activity.*

162(5) *A person must not use a flammable or combustible liquid at a temperature above its flash point in a washing or cleaning operation, unless the washing or cleaning equipment is specifically designed and manufactured for the use of the liquid.*

162(6) *A person must not store contaminated rags used to clean or wipe up flammable substances other than in a covered container that has a label that clearly indicates it is to be used for the storage of contaminated rags.*

Procedures and precautions

163(2) *If the hazard assessment required by Part 2 indicates that a work area is not a hazardous location, an employer must ensure that flammable substances stored or used at the work area,*

(a) will not be in sufficient quantity to produce an explosive atmosphere if inadvertently released,

(b) are not stored within 30 meters of an underground shaft,

(c) are not stored in the immediate vicinity of the air intake of

- (i.) a ventilation supply system,*
- (ii.) an internal combustion engine, or*
- (iii.) the fire box of a fired heater or furnace, and*
- (d) are stored only in containers approved to*
 - (i.) CSA Standard B376-M1980 (R1998), Portable Containers for Gasoline and Other Petroleum Fuels,*
 - (ii.) NFPA Standard 30, Flammable and Combustible Liquids Code, 2003 Edition; or*
 - (iii.) ULC Standard C30-1995, Containers, Safety.*

(2.1) *If the work requires that the contents of metallic or conductive containers be transferred from one container to another, an employer must ensure that static electricity is controlled while the contents are being transferred.*

Saskatchewan OHS Regulation

Procedures for flammable substances

363(1) Where a flammable substance is or is intended to be handled, used, stored, produced or disposed of at a place of employment, an employer, contractor or owner shall develop written procedures to ensure the health and safety of workers who:

- (a) handle, use, store, produce or dispose of a flammable substance that may spontaneously ignite or ignite when in combination with any other substance; or*
 - (b) perform hot work where there is a risk of fire.*
- (2) An employer, contractor or owner shall ensure that all workers who are required or permitted to perform work mentioned in subsection (1) are trained in, and implement, the procedures developed pursuant to subsection (1).*
- (3) Workers who perform work mentioned in subsection (1) shall implement the procedures developed pursuant to subsection (1).*

Receptacles for materials contaminated by flammable liquids

364 (1) An employer, contractor or owner shall ensure that materials contaminated by flammable liquids are placed in receptacles that:

- (a) are non-combustible and have close-fitting metal covers;*
 - (b) are labelled "flammable"; and*
 - (c) are located at least one meter away from other flammable liquids.*
- (1) (2) Where the surface on which a receptacle required by subsection (1) is placed is combustible, an employer shall ensure that the receptacle has a flanged bottom or legs that are not less than 50 millimeters high.*
- (2) A worker shall place materials contaminated by flammable liquids and garbage that may constitute a fire hazard into the appropriate receptacle required by this section or by section 362.*

Receptacles for combustible or flammable liquids

365 An employer, contractor or owner shall ensure that combustible and flammable liquids are kept in receptacles that meet the requirements of the National Fire Code of Canada 1990, including any Revisions and Errata published from time to time, respecting the storage of flammable and combustible liquids.

Hazardous activities involving combustible or flammable liquids

366(1) An employer or contractor shall ensure that:

- (a) no gasoline is used to start a fire or used as a cleaning agent; and
- (b) no worker is required or permitted:
 - (i) to replenish a tank on a heating device with a combustible or flammable liquid while the device is in operation or is hot enough to ignite the liquid; or
 - (ii) to place a tar pot, while in use, within three meters of an entrance to or exit from a building.
- (2) A worker shall not:
 - (a) use gasoline to start a fire or use gasoline as a cleaning agent; or (b) replenish a tank on a heating device with a flammable or combustible liquid while the device is in operation or is hot enough to ignite the liquid.

Control of ignition sources, static charges

367 An employer or contractor shall ensure that:

- (a) suitable procedures are developed and implemented to prevent the ignition of flammable liquids or explosive dusts that are present at a worksite;
- (b) all sources or potential sources of ignition are eliminated or controlled where an explosive atmosphere exists or is likely to exist; and
- (c) static charge accumulations during transfer of flammable liquids or explosive substances from one container to another are prevented by electrically bonding the containers.

Flammable liquids, gases or explosive substances in vehicles

368(1) An employer shall ensure that no worker undertakes any servicing or maintenance of a vehicle while a flammable liquid or gas or an explosive substance:

- (a) is loaded into or unloaded from the vehicle; or
- (b) is present in the vehicle in any place other than the fuel tank.
- (2) Where reasonably practicable, a worker who operates a vehicle that contains a flammable liquid or gas or an explosive substance shall ensure that the engine of the vehicle is shut off during the connection or disconnection of the lines for the loading or unloading of the flammable liquid, gas or explosive substance.

Flammable or explosive substance in atmosphere

369(1) Where a flammable or explosive substance is present in the atmosphere of a worksite at a level that is more than 20% of the lower explosive limit of that substance, an employer or contractor shall not require or permit a worker to enter or work at the worksite.

- (2) Subsection (1) does not apply to:
 - (a) a fire fighter who has been trained pursuant to section 482; or
 - (b) a competent worker who meets the requirements of subsection (3) and who is acting in an emergency situation at the place of employment.
- (3) An employer shall ensure that:
 - (a) the competent worker mentioned in clause (2)(b) is trained, equipped and works according to an approved standard;

- (b) the training required by clause (a) is provided by a competent person; and*
- (c) a written record is kept of all training delivered to a worker pursuant t*

British Columbia OHS Regulation

Containers and Storage

5.27 Ignition sources

- (1) When a flammable gas or a flammable liquid is handled, used or stored, all sources of ignition must be eliminated or adequately controlled.*
- (2) For the purposes of subsection (1) sources of ignition include open flame, spark-producing mechanical equipment, welding and cutting processes, smoking, static discharge and any electrical equipment or installation that is not approved for hazardous locations, as specified by the Electrical Safety Act.*
- (3) If the work involves more than one employer, the principal contractor or, if there is no principal contractor, the owner must ensure that sources of ignition resulting from the work of one employer are eliminated or adequately controlled in any work area where a flammable gas or a flammable liquid is handled, used or stored by any other employer.*

5.28 Grounding or bonding

Metallic or conductive containers used to transfer flammable liquids must be electrically bonded to each other or electrically grounded while their contents are being transferred from one container to the other.

5.31 Flammable gas or vapour

If it is not practicable to maintain the airborne concentration of a flammable gas or vapour below the applicable exposure limit, for example, in a temporary situation or an emergency,

- (a) only the minimum number of workers necessary for the work may be exposed,*
- (b) every worker exposed must be adequately trained and equipped to safely perform the required duties,*
- (c) the concentration of the flammable gas or vapour must not exceed 20% of the lower explosive limit (LEL), and*
- (d) in a life-threatening emergency only, exposure of emergency response workers is permitted above 20% of the LEL, provided that only those qualified and properly trained and equipped workers necessary to correct the unsafe condition are exposed to the hazard and every possible effort is made to control the hazard while this is being done.*

5.34 Combustible materials

Except for packaging used to contain flammable or combustible liquids, combustible shelves, racks and other materials are not permitted inside a flammable or combustible liquids storage room or storage cabinet unless required as part of a fire separation.



Manitoba Workplace Safety and Health Act and Regulations

Fire and Explosive Hazards

19.2 An employer must:

- a. develop and implement safe work procedures for fire and explosive hazards in the workplace, including hot work if hot work is performed in the workplace
- b. train workers in the safe work procedures

19.3 (1) an employer must ensure that

- a. fire protection equipment of an appropriate type and sufficient size and capacity to be effective is installed in the workplace in accordance with the Manitoba Fire Code.

19.8 (1) An employer must ensure that a worker does not enter a workplace where a flammable or explosive substance is present in the atmosphere at a level that is more than 10% of the lower explosive limit of that substance.

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