

Block A: Safety Related Functions



Plumbing Apprenticeship Program Level 1 Series

Block A: Safety Related Functions

BC Plumbing Apprenticeship, Level 1

SKILLEDTRADESBC

*BC PIPING ARTICULATION AND CURRICULUM SUBCOMMITTEE;
AUDREY CURRAN; MARK OVERGAARD; AND PAUL SIMPSON*

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Contents

Block A: Safety Related Functions Introduction	1
<i>Plumbing Apprenticeship Program Level 1 Series</i>	1
<i>Disclaimer</i>	3
<i>Safety Advisory</i>	3
<i>Symbol Legend</i>	4
<i>Acknowledgements</i>	5
<i>Resources</i>	6
<i>Accessibility</i>	xi

A-5 Fire Safety

A-5 Fire Safety Introduction	301
A-5.1 Describe the Conditions Necessary to Support a Fire	304
<i>Fuel</i>	305
<i>Oxygen</i>	305
<i>Heat</i>	305
<i>Flashpoint and Autoignition</i>	305
<i>Fire Triangle</i>	305
<i>Fire Tetrahedron</i>	306
<i>Self-Test A-5.1: Describe the Conditions Necessary to Support a Fire</i>	307
<i>References</i>	308
A-5.2 Identify Class of Fires and Extinguishers	309
<i>Classes of Fires</i>	309
<i>Types of Fire Extinguishers</i>	312
<i>Multipurpose Fire Extinguishers</i>	316
<i>Self-Test A-5.2: Identify Class of Fires and Extinguishers</i>	320
<i>References</i>	321

A-5.3 Apply Preventive Fire Safety Precautions	322
<i>Preparation</i>	323
<i>Storage of Flammable Materials</i>	323
<i>Shop Electrical Wiring and Equipment</i>	325
<i>Safe Use of Temporary Heating</i>	325
Self-Test A-5.3: Apply Preventive Fire Safety Precautions	326
References	326
A-5.4 Describe First-Response Firefighting	328
<i>Steps to Take Prior to Fighting a Fire</i>	328
<i>Training</i>	329
<i>Using a Portable Fire Extinguisher</i>	329
<i>Pull, Aim, Squeeze, Sweep (PASS)</i>	329
Self-Test A-5.4: Describe First-Response Firefighting	331
References	332
Self-Test A-5.1: Describe the Conditions Necessary to Support a Fire	334
Answer Key: Self-Test A-5.1	336
Self-Test A-5.2: Identify Class of Fires and Extinguishers	337
Answer Key: Self-Test A-5.2	339
Self-Test A-5.3: Apply Preventive Fire Safety Precautions	340
Answer Key: Self-Test A-5.3	341
Self-Test A-5.4: Describe First-Response Firefighting	342
Answer Key: Self-Test A-5.4	343

Glossary - Block A: Safety Related Functions	345
Appendix A	364
<i>Sample Safety Data Sheet for Chromium Acetate Hydroxide</i>	364
	365
	366
	367
	368
	369
	371
Version History	373
Plumbing Apprenticeship & Trade Resources in BC	374
<i>Plumbing Apprenticeship & Certification Resources</i>	374
<i>Workplace Safety & Regulations</i>	374
<i>Financial Supports</i>	374
<i>Mental Health & Wellness Support</i>	375
<i>Crisis Support</i>	375

Block A of the Plumbing Apprenticeship Program Level 1 Series features Skilled Trades BC industry-authority content on safety related functions in plumbing. Safety is a part of the job. When you take a job, you have a safety obligation to your employer, co-workers, family, and yourself. By recognizing and understanding the hazards in your work area, you can prevent the occurrence of many accidents. Most accidents are preventable. Both employees and employers must take responsibility for making the workplace safe.

Block A of the Plumbing Apprenticeship Program Level 1 Series focuses on the causes and results of workplace accidents, the short- and long-term hazards in the trades, general safety precautions and procedures, emergency equipment and facilities, how a workplace safety policy is established, lockout and tagout procedures, and ladder and scaffold usage.

Plumbing Apprenticeship Program Level 1 Series

The *Plumbing Apprenticeship Program Level 1 Series* offers comprehensive training materials designed to build on foundational skills and knowledge. The series is divided into four main blocks, each focusing on critical areas of plumbing systems and installations.

Block A: Safety Related Functions

(<https://a-safetyfunctions-bcplumbingapprli.pressbooks.tru.ca>)

A-1: Workplace Hazards

A-2: WorkSafeBC Regulations

A-3: Safe Handling of Hazardous Materials

A-4: Personal Safety Practices

A-5: Fire Safety

Block B: Tools and Equipment

(<https://b-handmeasuringtools-bcplumbingapprli.pressbooks.tru.ca>)

B-1: Use Hand Tools and Measuring Tools

B-2: Use Portable Power Tools and Use

B-3: Use Access Equipment

B-4: Use Rigging, Hoisting, Lifting and Positioning Equipment, and Rigging

B-5: Use Soldering and Brazing Equipment and Oxy-Fuel Cutting Equipment

B-6: Use Welding Equipment

Block C: Routine Trade Activities and Electrical Concepts

(<https://c-tradeactivities-electrical-bcplumbingapprli.pressbooks.tru.ca>)

C-1: Mathematics and Science

- C-2: Electrical Concepts and Principles of Electricity
- C-3: Drawings and Specifications
- C-4: Codes, Regulations and Standards
- C-5: Manufacturer and Supplier Documentation

Block D: Piping and Components

(<https://d-pipingcomponents-bcplumbingappri1.pressbooks.tru.ca>)

- D-1: Install Pipe and Tubing
- D-2: Install Valves
- D-3: Install Fittings
- D-4: Penetrate Structures

Plumbing Apprenticeship Program Overview and Upcoming Resources

- **Plumbing Apprenticeship Program Level 1 Series** (<https://openpress.trubox.ca/2024/12/13/plumbing-apprentice-level-1/>) can be found in the TRU Open Press Collection.
- **Plumbing Apprenticeship Program Level 2 Series** (<https://openpress.trubox.ca/2024/04/26/bc-plumbing-apprenticeship-level-2/>) can be found in the TRU Open Press Collection.
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Safety Advisory

The current Standards and Regulation in BC can be obtained at the WorkSafeBC website: <http://www.worksafebc.com> (<http://www.worksafebc.com>)

Please note that it is always the responsibility of any person using these materials to inform themselves about the Occupational Health and Safety Regulation pertaining to their areas of work.

Symbol Legend



Important Information



Potentially Toxic/ Poisonous Situation



Required or Optional Resources



Potentially Flammable Situation



Complete a Self-Test



Possibly Explosive Situation



Use Protective Equipment



Potential Electric Shock

Acknowledgements

The development of the *Plumbing Apprenticeship Level 1* learning resources was a collaborative effort driven by a commitment to excellence in trades education. These resources were created to support apprentices and journeypersons in mastering the skills and knowledge essential to the piping trades. This achievement would not have been possible without the dedication and expertise of *Skilled Trades BC* and the *Piping Trades Articulation Committee*, whose contributions, leadership, and guidance have been instrumental in shaping high-quality, industry-aligned training resources. We extend our sincere gratitude for their contributions and ongoing stewardship in advancing the piping trades.

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- Line A: Safe Work Practices: Competency A-1: Control Workplace Hazards (<https://collection.bccampus.ca/resource/tQtm8KNK>)
- Line A: Safe Work Practices: Competency A-2: Describe WorkSafeBC Regulations (<https://collection.bccampus.ca/resource/4x48JU bq>)
- Line A: Safe Work Practices: Competency A-3: Handle Hazardous Materials Safely (<https://collection.bccampus.ca/resource/PMfB6kHM>)
- Line A: Safe Work Practices: Competency A-4: Describe Personal Safety Practices (<https://collection.bccampus.ca/resource/xQpDrgQM>)
- Line A: Safe Work Practices: Competency A-5: Describe Fire Safety (<https://collection.bccampus.ca/resource/VPwUd4rq>)

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Resource Development Team 2024-2026

Content Review, Revision, and Development: BC Plumbing Articulation Curriculum Subcommittee and Audrey Curran

Final Content Review and Revisions: Audrey Curran and Mark Overgaard, BCIT

Project Lead (TRU Plumbing Trades): Paul Simpson, Curriculum Subcommittee Chair

Author: SkilledTradesBC

Publishing Manager/ Copy Editing: Dani Collins, MEd

Production: Jessica Obando Almache, BCS

- Co-op Students:
 - Greg Vilac
 - Riley Phillips
 - Vansh Sethi
 - Jesse Perkins
 - Daniel Abdulai
 - Kobe Shimoyama
 - Jose Contreras Antequera

Resources

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- Trades Training BC

For the latest BC Plumbing Trades Program Outline (2025), see the SkilledTradesBC website: www.skilledtrades.bc.ca (<https://skilledtradesbc.ca/>)

To order printed copies of Program Outlines or learning resources (where available) for BC Trades, contact:

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Starting December 1, 2022, Industry Training Authority was officially renamed to SkilledTradesBC. Hear more in this video from SkilledTradesBC CEO, Shelley Gray, on what this means for the trades industry and British Columbians. Closed captioning and transcripts are available with this video, Introducing Skilled Trades BC (<https://www.youtube.com/watch?v=OQgwdP0rNog>) (2022) on YouTube.



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References

- Camosun College. (n.d.). *Line A: Safe work practices*. BCcampus. <https://collection.bccampus.ca/textbook/tQtm8KNK/>
- SkilledTradesBC. (2025). Plumber program outline (Implementation date: August 18, 2025; Last revised: December 16, 2025) [PDF]. Province of British Columbia. <https://skilledtradesbc.ca/media/2776/download>
- SkilledTradesBC. (2022, December 1). Introducing Skilled Trades BC. YouTube. <https://www.youtube.com/watch?v=OQgwdP0rNog>

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Font	Font size can be zoomed to 200% in the webbook or eBook formats.	Yes

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- In addition to the web version, this book is available in a number of file formats, including PDF. The Print PDF has passed our Accessibility Check.

A-5 FIRE SAFETY

Plumber Apprenticeship Program – Level 1



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A-5 Fire Safety Introduction

As a trades worker, you have a responsibility to work safely, and fire prevention is a primary concern. Many of the work tasks you carry out include the application of heat and flame. You should be able to apply fire prevention practices, identify fire causes, and identify and apply fire-extinguishing agents to control or extinguish a fire. You are not expected to be an expert firefighter, but you may have to deal with a fire to protect your safety and the safety of others.

Learning Objectives

Once you have completed this section, you will be able to:

- Describe how fires start.
- Identify the fire triangle.
- Name the components of a fire triangle and explain how the fire triangle works.
- Identify and name the classes of fire.
- Identify and name the types of fire extinguishers.
- State the letters used to identify fire extinguishers.
- Select the correct type of extinguisher for each type of fire.
- Describe the procedures for extinguishing small fires.
- Describe proper methods for preventing fires.



You will be required to reference publications and videos available online at WorkSafeBC. (<https://www.worksafebc.com/en>)

Terminology

The following terms will be used throughout this section. A complete list of terms for this section can be found in the **Glossary**.

- **autoignition temperature:** The temperature at which a substance ignites on its own without a spark or

flame. (Section A-5.1)

- **chemical chain reaction:** A continuing chemical process that keeps a fire burning once it has started. (Section A-5.1)
- **class of fire:** A category that describes the type of material that is burning. (Section A-5.2)
- **combustible material:** A substance that can catch fire and burn. (Section A-5.1)
- **combustion:** Burning; a chemical reaction that produces heat and often light. (Section A-5.1)
- **construction heater:** A portable heater used at building sites to keep the air warm while workers are constructing or repairing a building; helps to dry materials like paint or concrete; keeps workers safe and comfortable in cold weather; can run on electricity, propane, natural gas, or diesel fuel. (Section A-5.3)
- **cooling:** In fire safety, means lowering the temperature of a fire, usually by adding water, so it no longer has enough heat to keep burning. (Section A-5.1)
- **dry chemical extinguisher:** A fire extinguisher that uses powder to put out a fire. (Section A-5.2)
- **energized electrical equipment:** Electrical equipment that is connected to power. (Section A-5.2)
- **extinguishing agent:** A substance used to put out a fire. (Section A-5.1)
- **flammable:** Able to catch fire easily. (Section A-5.2)
- **flashpoint:** The lowest temperature at which a liquid gives off vapour that can ignite with a spark or flame. (Section A-5.1)
- **fuel:** In fire safety, any material that can burn. (Section A-5.1)
- **fire tetrahedron:** A model that adds a chemical chain reaction as the fourth part needed to sustain a fire. (Section A-5.1)
- **fire triangle:** A model showing that fuel, oxygen, and heat are needed for a fire to start. (Section A-5.1)
- **fire watch:** A trained person who watches for fires during and after hot work. (Section A-5.3)
- **fume inhalation:** Breathing in harmful smoke or gases. (Section A-5.4)
- **hot work permit:** A written safety approval required before doing work that creates heat or sparks. (Section A-5.3)
- **hydrocarbons:** Chemical substances made of hydrogen and carbon that can burn, such as gasoline. (Section A-5.3)
- **ignition temperature:** The temperature at which a substance starts to burn. (Section A-5.1)
- **incipient-stage fire:** A very small fire that has just started. (Section A-5.4)
- **means of egress:** A safe way to exit a building during an emergency. (Section A-5.4)
- **multipurpose extinguisher:** An extinguisher that can be used on more than one class of fire. (Section A-5.2)
- **oxidation:** A chemical reaction where a substance combines with oxygen. (Section A-5.1)
- **oxidation agent:** A substance that helps something burn by providing oxygen or a similar effect. (Section A-5.1)
- **ozone layer:** A protective layer in the atmosphere that shields Earth from harmful sun rays. (Section A-5.2)
- **portable fire extinguisher:** A small device you can carry that sprays chemicals or water to put out a fire. (Section A-5.4)
- **pressurized cylinder:** Strong containers that hold gases under high pressure. (Section A-5.3)
- **purged:** Cleaned out to remove gases or dangerous substances. (Section A-5.3)
- **reignite:** To start burning again after being put out (Section A-5.4)
- **residue:** Material left behind after something is used. (Section A-5.2)
- **short circuit:** An electrical problem where electricity flows the wrong way and can cause sparks or fire. (Section A-5.3)

- **smothering:** In fire safety, means putting out a fire by cutting off its oxygen supply, so the fire cannot continue to burn. (Section A-5.1)
- **space heater:** A portable heaters used to warm a room or work area. (Section A-5.3)
- **starvation:** In fire safety, putting out a fire by removing its fuel source so it no longer has anything to burn. (Section A-5.1)
- **static grounding system:** A safety system that removes built-up electricity to prevent sparks. (Section A-5.3)
- **ventilation:** The movement of fresh air into a space to remove harmful gases or fumes. (Section A-5.3)

A-5.1 Describe the Conditions Necessary to Support a Fire

Fire or **combustion** is a form of **oxidation** (the union of a substance with **oxygen**). During the oxidation process, energy is released in the form of heat, sometimes accompanied by light. Oxidation takes place at varying rates of speed. Here are some examples of oxidation occurring at different rates:

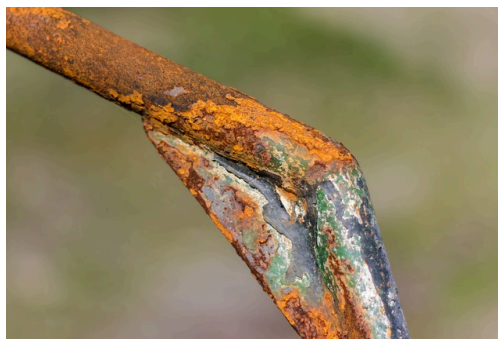


Figure 1 Oxidation (meineresterampe/Pixabay)
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- Very slow — the rusting of iron
- Slow — the spontaneous heating of materials such as oil-soaked rags
- Fast — the burning of paper or wood
- Extremely fast — the exploding of gunpowder upon ignition

Before a fire can occur, three elements must be present:



Figure 2 Burning (Jon Sullivan/Pixnio) CC0
(<https://creativecommons.org/publicdomain/zero/1.0/>)

- Fuel
- Oxygen

- Heat (sufficient to raise the fuel to its **ignition temperature**)

Fuel

Fuel is any **combustible material** in solid, liquid, or gas form that will combine with oxygen and heat to burn. Combustible material can include common materials such as wood, wood waste products, liquid chemicals, gasoline, paper, or cloth.

Oxygen

Oxygen supports combustion and is always present in the air we breathe at approximately 21 percent concentration. A typical fire requires an atmosphere with only approximately 16 percent oxygen. If pure oxygen were present, some materials that would not normally be considered combustible, including some metals, would burn.

The term **oxidizing agent** is now often used instead of **oxygen**, as it helps explain why some materials can burn in an atmosphere free of any other sources of oxygen.

Heat

Heat is anything that will raise the temperature of the fuel to a point where enough gases are given off to burn.

Flashpoint and Autoignition

Flashpoint and **autoignition temperature** both describe how easily a fuel can ignite, but they refer to different stages of combustion.

The flashpoint is the lowest temperature at which a liquid gives off enough vapour to ignite in the presence of an external ignition source (such as a spark or flame). The autoignition temperature is the lowest temperature at which a substance will spontaneously ignite without any external ignition source. For example, gasoline has a flashpoint of approximately -42.8°C (-45°F) and an autoignition temperature of about 246°C (475°F).

Fire Triangle

The **fire triangle** is a simple model for understanding the necessary ingredients for most fires: oxygen, heat, and fuel. When they combine in proper amounts, as shown in the fire triangle diagram (Figure 3), a fire is created. Keeping these three components separated will prevent a fire from occurring. An existing fire can be extinguished by removing any one of the three components.



Figure 3 Fire triangle (TRU Open Press) CC BY-NC-SA (<https://creativecommons.org/licenses/by-nc-sa/4.0/deed.en>)

Fire safety, at its most basic level, is based on the principle of keeping fuel sources and ignition sources separate:

1. Remove the fuel (combustible material) from the vicinity of the fire. For example, if you shut off the valve of a gas main, the result will be **starvation**.
2. Remove the heat. For example, by applying water, the result will be **cooling**.
3. Remove the oxygen. For example, if you cover the fire with a lid, a wet blanket, or sand, or use a carbon dioxide, foam, or dry chemical extinguisher, the result is **smothering**.

Fire Tetrahedron

Today there are many newly developed chemicals, resins, materials and metals that burn differently and have varying types of **chemical chain reactions** that do not fit the traditional theories of the fire triangle. A fourth component of a fire triangle may be a chemical reaction, creating a **fire tetrahedron**.

The fire tetrahedron represents the addition of a chemical chain reaction to the fire triangle. Once a fire has started, the resulting chain reaction sustains the fire and allows it to continue. Just as removing one of the elements of the fire triangle will extinguish a fire, so will using an extinguishing agent that breaks the chain reaction.

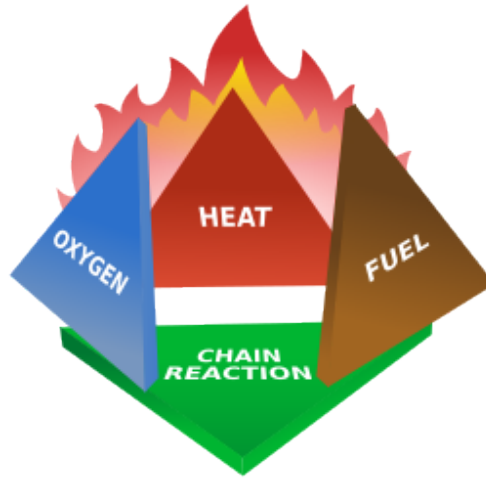


Figure 4 Fire tetrahedron (adapted) (Gustavb/
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Self-Test A-5.1: Describe the Conditions Necessary to Support a Fire

Complete Self-Test A-5.1 and check your answers.

If you are using a printed copy, please find Self-Test A-5.1 and Answer Key at the end of this section. If you prefer, you can scan the QR code with your digital device to go directly to the interactive Self-Test.





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- Camosun College. (2015). Trades access common core competency A-5: Describe Fire Safety. Victoria, B.C.: Crown Publications. Download for free from the B.C. Open Textbook Collection (<https://open.bccampus.ca/browse-ourcollection/find-open-textbooks/>).

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- **Figure 1** Oxidation (<https://pixabay.com/photos/rust-iron-metal-iron-oxide-oxide-962464/>) by meineresterampe from Pixabay is used under the Pixabay Content License (<https://pixabay.com/service/license-summary/>).
- **Figure 2** Burning (<https://pixnio.com/miscellaneous/fire-flames-pictures/campfires-burning-wood-pits>) by Jon Sullivan from Pixnio is used under the Pixnio CC0 (<https://creativecommons.org/publicdomain/zero/1.0/>) license.
- **Figure 3** Fire triangle (TRU Open Press) has been adapted from Fire triangle (https://commons.wikimedia.org/wiki/File:Fire_triangle.svg) by Gustavb on Wikimedia, and is subject to the CC BY-SA 3.0 (<https://creativecommons.org/licenses/by-sa/3.0/deed.en>) license.
- **Figure 4** Fire tetrahedron (https://commons.wikimedia.org/wiki/File:Fire_tetrahedron.svg) (adapted) by Gustavb (<https://en.wikipedia.org/wiki/User:Gustavb>), via Wikimedia Commons, is in the public domain (https://en.wikipedia.org/wiki/en:public_domain).

A-5.2 Identify Class of Fires and Extinguishers

During combustion, enough heat is produced to raise the fuel's temperature and release vapours that can ignite. The fire will continue burning as long as fuel, heat, and oxygen are present. To stop the process, an **extinguishing agent** — such as a fire extinguisher — must be used to break this cycle.

When sufficient heat is generated during combustion to raise the temperature of the fuel, vapours that can ignite are produced, and the burning process will continue as long as there is enough fuel, heat, and oxygen to sustain it. The process must be interrupted by means of an extinguishing agent, such as a fire extinguisher.

Classes of Fires

Fires are divided into five main classes: A, B, C, D, and K. The **class of fire** is important to know when selecting a fire extinguisher because it determines the type of extinguisher required. The symbols shown in Table 1 may be the only indication you have of the best use for a fire extinguisher.

Table 1: Fire Classes and Appropriate Extinguishers

Fire Class	Type of Fire	Common Materials Involved	Recommended Extinguishers	Important Safety Notes
Class A, Green				
	Ordinary combustibles	Wood, paper, cloth, rubber, many plastics	Water, foam, multipurpose dry chemical	Works by cooling the fire below ignition temperature
				
Class B, Red				
	Flammable liquids and gases	Gasoline, oil, grease, paint, solvents	Foam, CO ₂ , dry chemical	Never use water — it can spread the fire
				

Fire Class	Type of Fire	Common Materials Involved	Recommended Extinguishers	Important Safety Notes
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Class C, Blue



Energized electrical equipment

Electrical panels, wiring, appliances

CO₂, dry chemical

Must use non-conductive agents; de-energize equipment before using water



Class D, Yellow



Combustible metals

Magnesium, sodium, titanium, potassium

Special dry powder agents

Never use water — may cause explosion or violent reaction

Fire Class	Type of Fire	Common Materials Involved	Recommended Extinguishers	Important Safety Notes
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Class K, Black



Cooking oils and fats

Commercial kitchen oils and grease

Wet chemical (Class K extinguisher)

Designed for high-temperature cooking fires



Some materials, when burning, may produce toxic gases.

Types of Fire Extinguishers

All work sites must have portable fire extinguishers. These come in many sizes and colours and have several markings on them. Although most extinguishers can be used on more than one class of fire, none can be successfully used for all types of fire situations.

It is important that you know the location of and how to operate each extinguisher in your workplace. Because each manufacturer uses a slightly different operating procedure, you should carefully read the markings and instructions on the extinguisher. They explain how to use it and where it is most effective.



If you use the wrong type of fire extinguisher on the wrong class of fire, you can make the situation worse. It is therefore very important to understand the five fire classifications and recognize the identification symbols used on fire extinguishers!

Class A Fire Extinguishers

Class A extinguishers work by cooling the fire below its **ignition temperature**. They may use pressurized water, foaming agents, or multipurpose dry chemical agents. Water-based extinguishers may be pressurized, gravity-fed, or manually pumped.

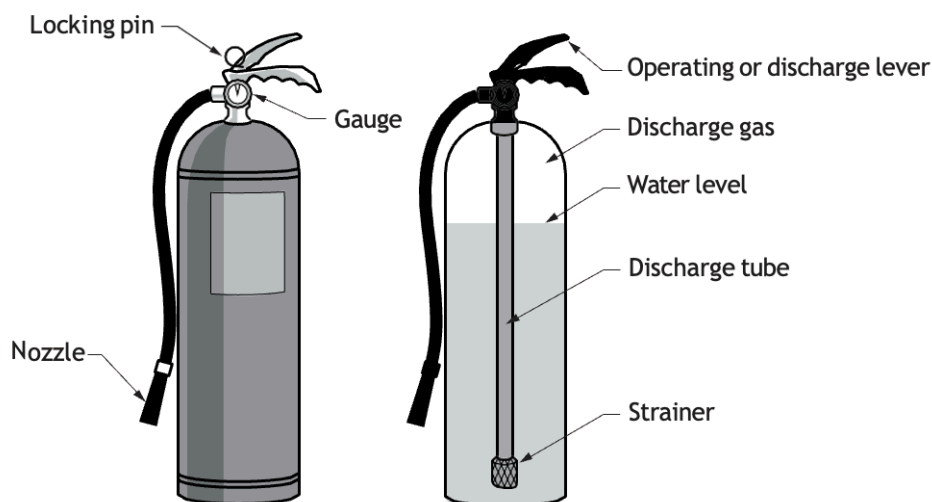


Figure 1 Pressurized water extinguisher for burning wood, paper, textiles, and other types of Class A fires. (BC Industry Training Authority, 2019). CC BY-NC-SA 4.0 (<https://creativecommons.org/licenses/by-nc-sa/4.0/>)

Class B Fire Extinguishers

Class B extinguishers should be used on **flammable** liquids or gases such as oils, paints, gasoline, and grease. These extinguishers may come in several types, including foam, carbon dioxide (CO₂), ordinary dry chemical, and multipurpose dry chemical.



Never use water to extinguish flammable liquid fires. Water is extremely ineffective at extinguishing this type of fire, and you may, in fact, spread the fire if you try to use water on it.

Class C Fire Extinguishers

Class C extinguishers are used on **energized electrical equipment**. These extinguishers may contain carbon dioxide (CO₂), ordinary dry chemicals, or multi-purpose dry chemicals. Carbon dioxide extinguishers are preferred for sensitive electrical equipment and computer components because they don't leave any harmful **residue**.



Never use water or any other agent that conducts electricity to extinguish a Class C fire. Electrical equipment must be unplugged or de-energized before using a water extinguisher.

Class D Fire Extinguishers

Class D fires involve combustible metals. The type of extinguisher required depends on the metal that is burning. The medium may include dry graphite, dry cast iron turnings, or other approved compounds with a graphite base, or a dry substance with a chloride base. When trying to suppress a Class D fire in its initial stage, localize the fire by scraping away any adjacent metal chips. The smothering material should then be applied gently to avoid scattering the fire. The material forms an air-excluding crust over the burning metal.



Figure 2 Extinguishing powder applied by shovel or scoop (BC Industry Training Authority, 2019). CC BY-NC-SA 4.0 (<https://creativecommons.org/licenses/by-nc-sa/4.0/>)



Under no circumstances should water or any standard fire extinguisher (of the pressurized or liquid type) be used to combat a magnesium fire.

Class K Fire Extinguishers

Class K fires involve combustible cooking oils and fats. These fires can spread rapidly and must be treated differently than Class B fires. Class K extinguishers may be portable or installed in commercial or industrial kitchens within ventilation hoods.



Figure 3 Class K fire extinguisher (Daniel Abdulai/TRU Open Press). CC BY-NC-SA (<https://creativecommons.org/licenses/by-nc-sa/4.0/deed.en>)

Multipurpose Fire Extinguishers

Manufacturers produce and supply single fire extinguishers designed for multiple classes of fire. **Multipurpose extinguishers** may contain dry powders that suppress more than one type of fire, such as Class A, B, or C fires. Carbon dioxide (CO₂) extinguishers are often labelled to fight both Class B and C fires.

Dry Chemical Extinguishers

Dry chemical extinguishers are filled with either foam or powder, usually sodium bicarbonate (baking soda) or potassium bicarbonate, and pressurized with nitrogen. Baking soda is effective because it decomposes at 700° C (1,580° F) and releases carbon dioxide (which smothers oxygen) once it decomposes.

Dry chemical extinguishers interrupt the **chemical chain reaction** of the fire by coating the fuel with a thin layer of powder or foam, separating the fuel from the surrounding oxygen. When used indoors, dry powder chemical extinguishers can reduce visibility and damage goods and machinery.

Dry chemical extinguishers are designed for Class B and C fires or Class A, B, and C fires, depending on the type of agent contained in the cylinder.

Three of the most commonly used dry chemicals are:

- **Triplex dry chemical:** a multipurpose dry chemical agent effective in extinguishing Class, A, B and C fires, generally considered the best all-round fire extinguisher
- **Quick-Aid dry chemical:** a specially treated sodium bicarbonate dry chemical agent that is moisture resistant and free-flowing; it is effective, approved for use on Class B and C fires, and offers the lowest cost per kilo of the three dry chemical agents
- **Purple K dry chemical:** a specially treated potassium bicarbonate dry chemical agent that provides effective protection against Class B and C fires and is approximately twice as effective as the standard sodium bicarbonate dry chemical

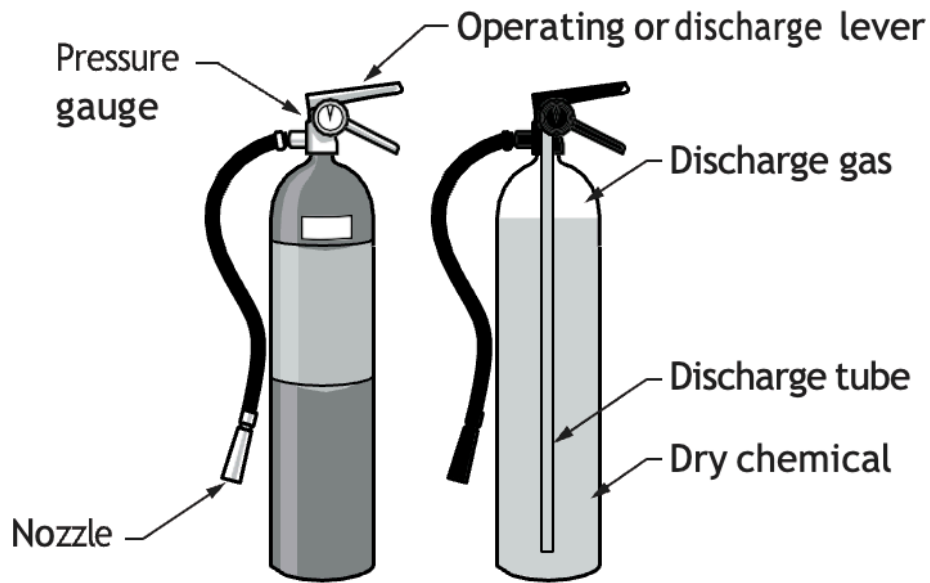


Figure 4 Dry chemical extinguisher (BC Industry Training Authority, 2019). CC BY-NC-SA 4.0 (<https://creativecommons.org/licenses/by-nc-sa/4.0/>)

Carbon Dioxide (CO₂) Extinguishers

A CO₂ extinguisher is recognized by its fibre discharge horn. It is less effective than dry chemical extinguishers but has the advantage of not leaving a residue that must be cleaned up.

CO₂ cylinders are red and range in size from 2.26 kg (5 lb.) to 45 kg (100 lb.) or larger. In the larger sizes, the hard horn is located on the end of a long, flexible hose.

These extinguishers contain pressurized carbon dioxide gas. CO₂ is heavier than oxygen, so these extinguishers work by displacing or taking away oxygen from the surrounding area. Additionally, CO₂ is very cold and works by cooling the fuel.

Carbon dioxide is ideal for fires involving electrical apparatuses and will also extinguish Class B liquid fires. However, the fire could reignite if the cooling effect has not reached the ignition temperature of the fuel.

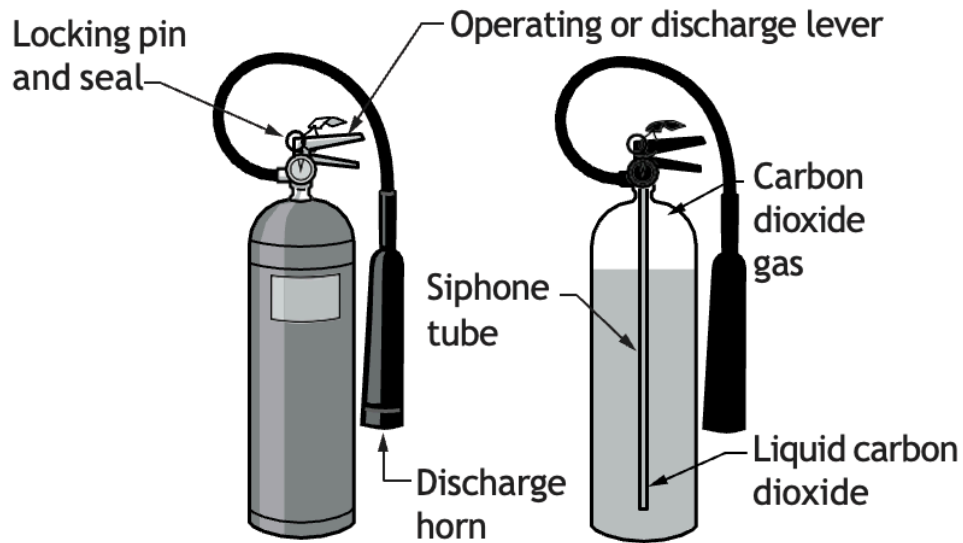


Figure 5 CO₂ extinguisher (BC Industry Training Authority, 2019). CC BY-NC-SA 4.0 (<https://creativecommons.org/licenses/by-nc-sa/4.0/>)

Halon Extinguishers

Halon extinguishers were designed for Class A, B, and C fires.



Halon is effective but has been banned because it damages the **ozone layer**. Existing units may still be found in some locations but cannot be refilled once discharged.

Emergency Fire Blanket

Emergency fire blankets are designed to smother flames if clothing catches fire. The blankets are about 2 m × 2 m (6 ft × 6 ft) in size.

Fire Extinguisher General Requirements

The following are general guidelines for maintaining and storing fire extinguishers:

- Portable fire extinguishers must be mounted in clearly visible and accessible locations.
- The size of an extinguisher is often based on the weight of the extinguishing agent. For example, 1 kg (2.5 lb.) is a small extinguisher.
- Class A and B extinguishers may have a number before the letter. These numbers allow you to compare the relative effectiveness of various fire extinguishers. For example, a multi-class extinguisher may be labelled as Class ABC—2.25 kg (5 lb.), 3A:10B:C. The A rating is a water equivalency rating. The number preceding the A multiplied by 1.25 gives the equivalent extinguishing capability in gallons of water. The number preceding the B indicates the size of fire in square feet that an ordinary user should be able to cover. The C does not have a number assigned.
- Portable fire extinguishers must be kept fully charged and operational.
- Fire extinguishers must have an annual maintenance inspection, at minimum.
- Records must be kept that identify the inspection, testing and maintenance/expiry dates and who completed the work.
- When an extinguisher is removed for maintenance or recharge, an alternate must be provided.
- Extinguishers should be located near exits. The location of the extinguisher should be clearly marked.
- All employees must be trained in the general principles of fire extinguisher use and the application hazards involved with first response firefighting.



Figure 6 ABC fire extinguisher with inspection tag (BC Industry Training Authority, 2019). CC BY-NC-SA 4.0 (<https://creativecommons.org/licenses/by-nc-sa/4.0/>)



Figure 7 Fire extinguisher near exit (BC Industry Training Authority, 2019). CC BY-NC-SA 4.0 (<https://creativecommons.org/licenses/by-nc-sa/4.0/>)



Self-Test A-5.2: Identify Class of Fires and Extinguishers

Complete Self-Test A-5.2 and check your answers.

If you are using a printed copy, please find Self-Test A-5.2 and Answer Key at the end of this section. If you prefer, you can scan the QR code with your digital device to go directly to the interactive Self-Test.





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- **Figure 3** Class K fire extinguisher (photos) are by Daniel Abdulai, esteemed team member of the TRU Open Press. This image is subject to the CC BY-NC-SA (<https://creativecommons.org/licenses/by-nc-sa/4.0/deed.en>) license.

A-5.3 Apply Preventive Fire Safety Precautions



Figure 1 Fire Prevention Infographic (TRU Open Press/ChatGPT) CC BY-NC-SA 4.0 (<https://creativecommons.org/licenses/by-nc-sa/4.0/>)

As you already know, fire is only possible where there is a supply of combustible materials, oxygen, and heat. However, lack of caution, equipment failure, or simple human error can cause ignition.

Any fire in the workplace can cause serious injury or property damage. Workers are often required to work in various hazardous environments. Corrosive and explosive substances may be used or stored in these locations. Workers must be aware of the presence of these hazardous substances and take appropriate precautions.

Preparation

Preparation is key to controlling any fires that may start. Take the following precautions to protect your workplace from fire:

- Keep the work area clean and clutter-free.
- Know what chemicals you work with.
- Know how to store and handle the chemicals on your work site.
- Make sure you are familiar with your company's emergency action plan for fires.
- Know what you are expected to do in a fire emergency.
- Know how to report fires.
- Use caution when using power tools near flammable substances.

Hot Work Permit

Ideally, all welding, cutting, or other torch work would be done in areas free of combustible materials; however, this is not always possible. In those cases, you may be required to get a **hot work permit** so that all fire hazards in your area can be assessed and the necessary precautions can be listed. Usually, this will involve posting **fire watch** personnel.

The person on fire watch should have access to fire extinguishers and alarms and know how to use them. The area where the hot work was done must also be monitored afterwards until there is no longer a risk of fire.

Storage of Flammable Materials

The nature of flammable materials makes them vulnerable to ignition. Consequently, storage precautions are necessary. Both WorkSafeBC and the BC Fire Code (<https://www2.gov.bc.ca/gov/content/industry/construction-industry/building-codes-standards/bc-codes/fire>) have regulations regarding maximum quantities of flammable materials that can be stored and how they are stored. The permitted quantities are affected by their flashpoint temperatures.

Flammable Liquids and Related Equipment

The nature of flammable liquids makes them very vulnerable to ignition, and the following storage precautions are therefore necessary:

- All containers of flammable liquids must be of an approved type (CSA or ULC in Canada) and clearly marked.
- All containers must have secure capping devices.

- Open flames or lit cigarettes must be prohibited within or near any liquid-gas storage area.
- Where drums are used as containers, they must have taps and a drip tray.
- Transportation must only take place while containers are sealed.
- All empty containers must be stored upright.
- Spills must be cleaned up or covered with sand.

Any equipment that requires a flammable liquid needs the same basic precautionary measures as stored liquids. All tank or equipment leaks must be reported and then repaired immediately.

Drivers and operators must be warned of ignition hazards while refuelling such equipment. They must not smoke, and the engines must be stopped.

Flammable Gases

Flammable gases used on work sites often include acetylene, hydrogen, ethane, and propane. These gases are **hydrocarbons**. Natural gas, acetylene, ethane, and propane are compounds, while diesel and gasoline are mixtures made up of mostly hydrocarbon compounds. Some of these gases are stored in **pressurized cylinders**, which must be handled with care.

Read OHS Regulation Part 5: Chemical Agents and Biological Agents (<https://www.worksafebc.com/en/law-policy/occupational-health-safety/searchable-ohs-regulation/ohs-regulation/part-05-chemical-and-biological-substances>) from the WorkSafeBC website.

Aerosol products can contain flammable gases and present a fire hazard. You should be familiar with how to handle and dispose of such products safely.

Ventilation

Flammable gases or vapours may accumulate in a room as part of the workplace process. It is important to properly **ventilate** the space to reduce the risk of fire and health hazards.

Do not cut or weld any container that you suspect may have contained a combustible substance. Even a gasoline tank that contains no liquid gasoline can have enough vapours present to cause an explosion. You must have the container thoroughly **purged** and inspected.

Combustible Materials

Rubbish is a severe problem in fire prevention, but it can always be avoided through good management. Any buildup of packing materials, sawdust, wood shavings, oil waste, or other combustible material constitutes a potential fire hazard. The following precautions must always be taken:

- All waste liquids that are flammable must be placed in approved containers for disposal according to waste disposal regulations.
- Open fires require a permit, and they must be constantly supervised.

- Extinguishers must be available at or near any fire lit for the disposal of rubbish.
- All oily rags must be retained in metal bins with sealed lids.
- Don't allow fine dust to build up, as it can be highly flammable and often explosive.

Shop Electrical Wiring and Equipment

All wiring, whether permanent or temporary, must be made safe so that it does not cause a fire. The following precautions are necessary:

- Any temporary or permanent wiring at ground level must be buried or protected from foot or vehicular traffic damage by use of ramps.
- All portable electric-powered hand tools must be connected with flexible rubber or sheathed PVC cables.
- Adequate breaker protection against excess current must be included.

A **static grounding system** must be used on fuel storage equipment to ensure there isn't a buildup of static electricity that could arc spark to ground and cause an explosion.

Vehicle Electrical Systems

You should observe extreme caution when servicing electrical systems. Serious fires could result from **short circuits** in the wiring. Batteries being charged or exposed to heavy discharge (such as during a cold or no-start situation) give off explosive gases (hydrogen), which can ignite if a spark is present.

When removing batteries, always disconnect the ground wire first. All wiring leading to the starter motor and switch must be protected from sharp edges and mechanical or heat damage. If installing a new cable, always route it to avoid damage.

Safe Use of Temporary Heating

Temporary heating is often required on the job site. This heating may be powered by electricity or fuelled by propane, kerosene, or diesel. These heaters are usually non-ducted and are therefore considered **space heaters** — although they are commonly known as **construction heaters**. It is important to follow the manufacturer's instructions and take extra precautions against burns and fire when using these heaters.



Self-Test A-5.3: Apply Preventive Fire Safety Precautions

Complete Self-Test A-5.3 and check your answers.

If you are using a printed copy, please find Self-Test A-5.3 and Answer Key at the end of this section. If you prefer, you can scan the QR code with your digital device to go directly to the interactive Self-Test.



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- **Figure 1** Fire Prevention Infographic was created by TRU Open Press with help from ChatGPT (OpenAI), 2026. Licensed under CC BY-NC-SA 4.0 (<https://creativecommons.org/licenses/by-nc-sa/4.0/>).

A-5.4 Describe First-Response Firefighting

First-response firefighting can best be described as extinguishing a fire in its initial stages by using whatever is readily available, before it becomes too large. First-response extinguishers are designed to deal with fires in their infancy. They are necessary even when an area is protected by a **fire sprinkler system**.

Small fires can often be put out quickly by a well-trained individual using a **portable fire extinguisher**. However, to do this safely, the person must understand the proper use and limitations of a portable fire extinguisher and the hazards associated with fighting fires.

Attempting to extinguish even a small fire carries some risk. Fires can increase in size and intensity in seconds, blocking the exit path and creating a **hazardous atmosphere**. Employees are not expected to fight fires. Your responsibility in a fire situation is to alert others and to evacuate.

Steps to Take Prior to Fighting a Fire

Fires can be very dangerous, and you should always ensure that you will not endanger yourself or others when attempting to put out a fire. For this reason, you must take the following steps when a fire is discovered:

1. Assist any person in immediate danger to safety, while keeping your own safety in mind.
2. Activate the building fire alarm system or notify the fire department by dialling 911 (or designating someone else to notify the department for you).
3. Position yourself with a clear **means of egress** at your back before attempting to use an extinguisher.

Only after completing these three steps—and only if the fire is small, contained, and not spreading—should you attempt to use an extinguisher.

Do not fight a fire when:

- You don't know what is burning. If you don't know what is burning, you don't know what type of extinguisher to use. Even if you have an ABC extinguisher, there may be something in the fire that could explode or produce highly toxic smoke. Chances are you will know what's burning, or at least have a pretty good idea, but if you don't, let the fire department handle it.
- The fire is spreading rapidly beyond the spot where it started. Exit the area immediately to a safe location.
- You don't have appropriate **firefighting equipment** (correct type and size).
- You are unable to protect yourself from excessive smoke or **fume inhalation** (plastics and synthetics gases can be fatal in very small amounts).
- Your instincts tell you not to. If you are uncomfortable for any reason, just allow the fire department to handle the situation.

In these situations, trained firefighters should deal with the fire.

Training

All workers required to use fire extinguishers must receive training that includes:

- Extinguisher locations
- Classes of fire most likely to occur and the appropriate extinguisher to use
- When and how to use extinguishers
- The importance of sounding the alarm
- Health and safety hazards
- **Personal protective equipment**

Using a Portable Fire Extinguisher

To extinguish a fire with a portable extinguisher, a person must:

- Have immediate access to the extinguisher
- Know how to operate the unit
- Know how to apply the extinguishing agent effectively

Portable fire extinguishers contain a limited amount of **extinguishing agent** and can discharge in seconds. Therefore, individuals should attempt to fight only very small or **incipient-stage fires**.

There are various models and designs of extinguishers. Some are manually operated, such as water pump types, while others are **pressurized** designs.

Pull, Aim, Squeeze, Sweep (PASS)

The proper use of a portable fire extinguisher can be easily remembered using the acronym PASS.

Stand a safe distance from the fire—about 2 to 3 m (6 to 10 ft)—while holding the extinguisher upright. Standing too close may cause burning materials to scatter and spread the fire.

Pull

Pull the pin from the handle, breaking the plastic seal.



Figure 1 Pull the pin (BC Industry Training Authority, 2019). CC BY-NC-SA 4.0 (<https://creativecommons.org/licenses/by-nc-sa/4.0/>)

Aim

Aim the extinguisher nozzle at the base of the flames. This is where the burning material is located. If you aim at the flames, which is frequently the temptation, the extinguishing agent will fly right through and be ineffective. You want to hit the **fuel source**.



Figure 2 Aim the nozzle (BC Industry Training Authority, 2019). CC BY-NC-SA 4.0 (<https://creativecommons.org/licenses/by-nc-sa/4.0/>)

Squeeze and Sweep

Keep the extinguisher upright and squeeze the handles together to discharge the pressurized extinguishing agent.

Sweep the extinguisher nozzle from side to side, covering the fire completely with extinguishing agent. Start using the extinguisher from a safe distance and move forward carefully—watch for scattering material. The idea is to completely cover the fuel. Keep spraying until the fire is out and monitor the area in case it **reignites**.



Figure 3 Squeeze and sweep (BC Industry Training Authority, 2019). CC BY-NC-SA 4.0 (<https://creativecommons.org/licenses/by-nc-sa/4.0/>)



Self-Test A-5.4: Describe First-Response Firefighting

Complete Self-Test A-5.4 and check your answers.

If you are using a printed copy, please find Self-Test A-5.4 and Answer Key at the end of this section. If you prefer, you can scan the QR code with your digital device to go directly to the interactive Self-Test.



An interactive H5P element has been excluded from this version of the text. You can view it online here:
<https://a-safetyfunctions-bcplumbingapprl1.pressbooks.tru.ca/?p=1249#h5p-29> (<https://a-safetyfunctions-bcplumbingapprl1.pressbooks.tru.ca/?p=1249#h5p-29>)

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- Camosun College. (2015). Trades access common core competency A-5: Describe Fire Safety. Victoria, B.C.: Crown Publications. Download for free from the B.C. Open Textbook Collection (<https://open.bccampus.ca/browse-ourcollection/find-open-textbooks/>).

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Self-Test A-5.1: Describe the Conditions Necessary to Support a Fire

Complete Self-Test A-5.1 and check your answers.

1. What three components must you have to support combustion?
 - a. Fuel, heat, carbon dioxide
 - b. Heat, oxygen, fuel
 - c. Carbon monoxide, fuel, heat
 - d. Fuel, oxygen, carbon dioxide
2. Keeping the components of combustion separated will prevent a fire.
 - a. True
 - b. False
3. Oxidation is the process of oxygen uniting with another element.
 - a. True
 - b. False
4. When a gas fire is being extinguished how does shutting off the main valve affect the fire?
 - a. Cooling
 - b. Starvation
 - c. Smothering
 - d. Disconnecting
5. When a wood fire is being extinguished, how does applying water affect the fire?
 - a. Cooling
 - b. Starvation
 - c. Saturation
 - d. Smothering
6. When a fire is being extinguished, how does covering the fire with a lid or wet blanket affect the fire?
 - a. Cooling
 - b. Starvation
 - c. Pressurizing
 - d. Smothering
7. What is the fourth component that creates the fire tetrahedron?
 - a. Aerobic reaction
 - b. Metabolic reaction
 - c. Chemical destabilizers
 - d. Chemical chain reaction
8. When foam is applied to a fire, what is the result?
 - a. Cooling
 - b. Starvation
 - c. Reignition
 - d. Smothering

Answer Key: Self-Test A-5.1 is on the other page.

Answer Key: Self-Test A-5.1

1. b. heat, oxygen, fuel
2. a. true
3. a. true
4. b. starvation
5. a. cooling
6. d. smothering
7. d. chemical chain reaction
8. d. smothering

Self-Test A-5.2: Identify Class of Fires and Extinguishers

Complete Self-Test A-5.2 and check your answers.

1. What is the classification of an electrical fire?
 - a. Class A
 - b. Class B
 - c. Class C
 - d. Class D
2. In a Class C fire, what is the burning material?
 - a. Flammable liquids
 - b. Combustible metals
 - c. Ordinary combustibles
 - d. Electrical conductors or components
3. What class are fires involving gasoline and other flammable liquids?
 - a. Class A
 - b. Class B
 - c. Class C
 - d. Class D
4. What is the symbol indicating that an extinguisher is suitable for Class C fires?
 - a. Star
 - b. Circle
 - c. Square
 - d. Triangle
5. What is the symbol indicating that an extinguisher is suitable for Class B fires?
 - a. Star
 - b. Circle
 - c. Square
 - d. Triangle
6. What class are fires involving ordinary combustibles such as wood?
 - a. Class A
 - b. Class B
 - c. Class C
 - d. Class D
7. How are fire extinguishers classified?
 - a. Local regulations
 - b. Weight when full
 - c. How long they will last
 - d. Type of fire they will extinguish
8. What is the symbol indicating that an extinguisher is suitable for Class A fires?
 - a. Star
 - b. Circle

- c. Square
 - d. Triangle
9. What is the symbol that is used to indicate that an extinguisher is suitable to extinguish a Class D fire?
- a. Star
 - b. Circle
 - c. Square
 - d. Triangle
10. What class of fire would be fought with an extinguisher that could be installed with the exhaust hood of a commercial kitchen, to fight grease fire?
- a. Class A
 - b. Class B
 - c. Class C
 - d. Class K

Answer Key: Self-Test A-5.2 is on the other page.

Answer Key: Self-Test A-5.2

1. c. Class C
2. d. Electrical conductors or components
3. b. Class B
4. b. Circle
5. c. Square
6. a. Class A
7. d. Type of fire they will extinguish
8. d. Triangle
9. a. Star
10. d. Class K

Self-Test A-5.3: Apply Preventive Fire Safety Precautions

Complete Self-Test A-5.3 and check your answers.

1. When might you require a hot work permit?
 - a. Working on hot materials
 - b. Doing any welding or cutting
 - c. Handling explosive chemicals
 - d. Doing welding or cutting in areas with combustible materials
2. When the hot work is completed all personnel must exit the area immediately.
 - a. True
 - b. False
3. What material characteristic affects the maximum quantities of flammable materials stored?
 - a. Latent heat
 - b. Specific heat
 - c. Lower explosive limit
 - d. Flashpoint temperature
4. What precaution should be taken when removing a vehicle battery?
 - a. Cut the red wire
 - b. Remove supply wire first
 - c. Remove ground wire first
 - d. Remove both wires simultaneously
5. What is another name for temporary construction heaters?
 - a. Ducted heaters
 - b. Electric heaters
 - c. Space heaters
 - d. Radiant heaters
6. Which of the following are mixtures of hydrocarbons?
 - a. Hydrocarbon and oxygen
 - b. Ethanol and diesel
 - c. Diesel and gasoline
 - d. Propane and acetylene

Answer Key: Self-Test A-5.3 is on the other page.

Answer Key: Self-Test A-5.3

1. d. Welding or cutting in areas with combustible materials
2. b. False
3. d. Flashpoint temperature
4. c. Remove ground wire first.
5. c. Space heaters
6. c. Diesel and gasoline

Self-Test A-5.4: Describe First-Response Firefighting

Complete Self-Test A-5.4 and check your answers.

1. What is the first step to take when a fire is discovered?
 - a. Use an extinguisher to put it out
 - b. Activate the building fire alarm system
 - c. Notify the fire department by dialing 911
 - d. Assist any person in immediate danger to safety
2. If you don't know what is burning, make sure that you use an ABC fire extinguisher.
 - a. True
 - b. False
3. Any worker can and should use a fire extinguisher.
 - a. True
 - b. False
4. What should you do if the fire is spreading rapidly?
 - a. Get a larger fire extinguisher
 - b. Exit the area to a safe location
 - c. Help the fire department extinguish the fire
 - d. Get a fellow worker to help you extinguish it
5. Portable fire extinguishers contain a limited amount of extinguishing agent.
 - a. True
 - b. False
6. What does the acronym PASS stand for?
 - a. Pin, Aim, Stand, Safe
 - b. Pull, Aim, Start, Sweep
 - c. Plastic, Access, Strap, Seal
 - d. Pull, Aim, Squeeze, Sweep
7. You should stand as close to the fire as possible when using a fire extinguisher as long as you don't feel too much heat.
 - a. True
 - b. False

Answer Key: Self-Test A-5.4 is on the other page.

Answer Key: Self-Test A-5.4

1. d. Assist any person in immediate danger to safety
2. b. False
3. b. False
4. b. Exit the area to a safe location.
5. a. True
6. d. Pull, Aim, Squeeze, Sweep
7. b. False

Sample Safety Data Sheet for Chromium Acetate Hydroxide

Printable PDF: Cr-Ac-OH-MSDS_SigmaAldrich (http://a-safetyfunctions-bcplumbingapprl1.pressbooks.tru.ca/wp-content/uploads/sites/241/2025/01/Cr-Ac-OH-MSDS_SigmaAldrich.pdf)

Material Safety Data Sheet

Version 4.1
Revision Date 10/23/2010
Print Date 02/08/2011

1. PRODUCT AND COMPANY IDENTIFICATION

Product name	: Chromium(III) acetate hydroxide	
Product Number	: 318108	
Brand	: Aldrich	
Product Use	: For laboratory research purposes.	
Supplier	: Sigma-Aldrich Canada, Ltd 2149 Winston Park Drive OAKVILLE ON L6H 6J8 CANADA	Manufacturer : Sigma-Aldrich Corporation 3050 Spruce St. St. Louis, Missouri 63103 USA
Telephone	: +19058299500	
Fax	: +19058299292	
Emergency Phone # (For both supplier and manufacturer)	: 1-800-424-9300	
Preparation Information	: Sigma-Aldrich Corporation Product Safety - Americas Region 1-800-521-8956	

2. HAZARDS IDENTIFICATION

Emergency Overview

WHMIS Classification

Not WHMIS controlled.

Not WHMIS controlled.

GHS Classification

Acute toxicity, Inhalation (Category 4)

Acute toxicity, Dermal (Category 4)

Acute toxicity, Oral (Category 4)

Skin irritation (Category 2)

Eye irritation (Category 2A)

Specific target organ toxicity - single exposure (Category 3)

GHS Label elements, including precautionary statements

Pictogram



Signal word

Warning

Hazard statement(s)

H302 + H312

Harmful if swallowed or in contact with skin.

H315

Causes skin irritation.

H319

Causes serious eye irritation.

H332

Harmful if inhaled.

H335

May cause respiratory irritation.

Precautionary statement(s)

P261

Avoid breathing dust/ fume/ gas/ mist/ vapours/ spray.

P264

Wash skin thoroughly after handling.

P270

Do not eat, drink or smoke when using this product.

P271

Use only outdoors or in a well-ventilated area.

P280

Wear protective gloves/ eye protection/ face protection.

P301 + P312

IF SWALLOWED: Call a POISON CENTER or doctor/ physician if you feel unwell.

P302 + P352 IF ON SKIN: Wash with plenty of soap and water.
P304 + P340 IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing.
P305 + P351 + P338 IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
P312 Call a POISON CENTER or doctor/ physician if you feel unwell.
P322 Specific measures (see supplemental first aid instructions on this label).
P330 Rinse mouth.
P332 + P313 If skin irritation occurs: Get medical advice/ attention.
P337 + P313 If eye irritation persists: Get medical advice/ attention.
P362 Take off contaminated clothing and wash before reuse.
P403 + P233 Store in a well-ventilated place. Keep container tightly closed.
P405 Store locked up.
P501 Dispose of contents/ container to an approved waste disposal plant.

HMIS Classification

Health hazard: 0
Flammability: 0
Physical hazards: 0

Potential Health Effects

Inhalation May be harmful if inhaled. May cause respiratory tract irritation.
Skin May be harmful if absorbed through skin. May cause skin irritation.
Eyes May cause eye irritation.
Ingestion May be harmful if swallowed.

3. COMPOSITION/INFORMATION ON INGREDIENTS

Formula : $C_{14}H_{23}Cr_3O_{16}$
Molecular Weight : 603.31 g/mol

CAS-No.	EC-No.	Index-No.	Concentration
Chromium(III) acetate hydroxide			
39430-51-8	254-447-3	-	-

4. FIRST AID MEASURES

General advice

Consult a physician. Show this safety data sheet to the doctor in attendance.

If inhaled

If breathed in, move person into fresh air. If not breathing, give artificial respiration. Consult a physician.

In case of skin contact

Wash off with soap and plenty of water. Consult a physician.

In case of eye contact

Rinse thoroughly with plenty of water for at least 15 minutes and consult a physician.

If swallowed

Never give anything by mouth to an unconscious person. Rinse mouth with water. Consult a physician.

5. FIRE-FIGHTING MEASURES

Conditions of flammability

Not flammable or combustible.

Suitable extinguishing media

Use water spray, alcohol-resistant foam, dry chemical or carbon dioxide.

Special protective equipment for fire-fighters

Wear self contained breathing apparatus for fire fighting if necessary.

Hazardous combustion products

Hazardous decomposition products formed under fire conditions. - Carbon oxides, Chromium oxides

Explosion data - sensitivity to mechanical impact

no data available

Explosion data - sensitivity to static discharge

no data available

6. ACCIDENTAL RELEASE MEASURES**Personal precautions**

Use personal protective equipment. Avoid dust formation. Avoid breathing vapors, mist or gas. Ensure adequate ventilation. Evacuate personnel to safe areas. Avoid breathing dust.

Environmental precautions

Do not let product enter drains.

Methods and materials for containment and cleaning up

Pick up and arrange disposal without creating dust. Sweep up and shovel. Keep in suitable, closed containers for disposal.

7. HANDLING AND STORAGE**Precautions for safe handling**

Avoid contact with skin and eyes. Avoid formation of dust and aerosols.

Provide appropriate exhaust ventilation at places where dust is formed. Normal measures for preventive fire protection.

Conditions for safe storage

Keep container tightly closed in a dry and well-ventilated place.

Keep in a dry place.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Contains no substances with occupational exposure limit values.

Personal protective equipment**Respiratory protection**

For nuisance exposures use type P95 (US) or type P1 (EU EN 143) particle respirator. For higher level protection use type OV/AG/P99 (US) or type ABEK-P2 (EU EN 143) respirator cartridges. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

Hand protection

Handle with gloves. Gloves must be inspected prior to use. Use proper glove removal technique (without touching glove's outer surface) to avoid skin contact with this product. Dispose of contaminated gloves after use in accordance with applicable laws and good laboratory practices. Wash and dry hands.

Eye protection

Safety glasses with side-shields conforming to EN166 Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU).

Skin and body protection

Complete suit protecting against chemicals. The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.

Hygiene measures

Handle in accordance with good industrial hygiene and safety practice. Wash hands before breaks and at the end of workday.

Specific engineering controls

Use mechanical exhaust or laboratory fumehood to avoid exposure.

9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance

Form	powder
Colour	green

Safety data

pH	no data available
Melting/freezing point	no data available
Boiling point	no data available
Flash point	no data available
Ignition temperature	no data available
Autoignition temperature	no data available
Lower explosion limit	no data available
Upper explosion limit	no data available
Vapour pressure	no data available
Density	no data available
Water solubility	no data available
Partition coefficient: n-octanol/water	no data available
Relative vapour density	no data available
Odour	no data available
Odour Threshold	no data available
Evaporation rate	no data available

10. STABILITY AND REACTIVITY

Chemical stability

Stable under recommended storage conditions.

Possibility of hazardous reactions

no data available

Conditions to avoid

no data available

Materials to avoid

Strong oxidizing agents

Hazardous decomposition products

Hazardous decomposition products formed under fire conditions. - Carbon oxides, Chromium oxides

11. TOXICOLOGICAL INFORMATION

Acute toxicity

Oral LD50

no data available

Inhalation LC50

Dermal LD50

Other information on acute toxicity

no data available

Skin corrosion/irritation

no data available

Serious eye damage/eye irritation

no data available

Respiratory or skin sensitization

no data available

Germ cell mutagenicity

no data available

Carcinogenicity

IARC: No component of this product present at levels greater than or equal to 0.1% is identified as probable, possible or confirmed human carcinogen by IARC.

ACGIH: No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by ACGIH.

Reproductive toxicity

no data available

Teratogenicity

no data available

Specific target organ toxicity - single exposure (Globally Harmonized System)

Inhalation - May cause respiratory irritation.

Specific target organ toxicity - repeated exposure (Globally Harmonized System)

no data available

Aspiration hazard

no data available

Potential health effects

Inhalation	May be harmful if inhaled. May cause respiratory tract irritation.
Ingestion	May be harmful if swallowed.
Skin	May be harmful if absorbed through skin. May cause skin irritation.
Eyes	May cause eye irritation.

Signs and Symptoms of Exposure

To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.

Synergistic effects

no data available

Additional Information

RTECS: Not available

12. ECOLOGICAL INFORMATION**Toxicity**

no data available

Persistence and degradability

no data available

Bioaccumulative potential

no data available

Mobility in soil

no data available

PBT and vPvB assessment

no data available

Other adverse effects

no data available

13. DISPOSAL CONSIDERATIONS

Product

Offer surplus and non-recyclable solutions to a licensed disposal company.

Contaminated packaging

Dispose of as unused product.

14. TRANSPORT INFORMATION

DOT (US)

Not dangerous goods

IMDG

Not dangerous goods

IATA

Not dangerous goods

15. REGULATORY INFORMATION

DSL Status

This product contains the following components listed on the Canadian NDSL list. All other components are on the Canadian DSL list.

Chromium(III) acetate hydroxide

CAS-No.

39430-51-8

WHMIS Classification

Not WHMIS controlled.

Not WHMIS controlled.

This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations and the MSDS contains all the information required by the Controlled Products Regulations.

16. OTHER INFORMATION

Further information

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The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Sigma-Aldrich Co., shall not be held liable for any damage resulting from handling or from contact with the above product. See reverse side of invoice or packing slip for additional terms and conditions of sale.

Referred to in A-3.4 Describe Information to be Disclosed on a Safety Data Sheet (SDS)

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Version History

This page provides a record of changes made to this learning resource, Plumbing Apprenticeship Level 1, Block A (<https://a-safetyfunctions-bcplumbingappr11.pressbooks.tru.ca/>). Each update increases the version number by 0.1. The most recent version is reflected in the exported files for this resource.

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If you identify an error in this resource, please report it using the TRU Open Education Resource Error Form.

Version	Date	Change	Details
1.0	May, 2026	Plumbing Apprenticeship Level 1 Block A learning resource from STBC content converted to open and freely accessible digital platform and published at TRU.	

Plumbing Apprenticeship & Trade Resources in BC

A successful career in plumbing requires a strong foundation of skills, knowledge, and workplace safety awareness. Below are key resources to support plumbing apprentices in BC, including educational pathways, trade certifications, workplace safety guidelines, and mental health and wellness support.

Plumbing Apprenticeship & Certification Resources

- **SkilledTradesBC – Plumbing Apprenticeship** (<https://skilledtradesbc.ca/plumber>) – Overview of plumbing training, certification requirements, and apprenticeship pathways in British Columbia.
- **Red Seal Program – Plumber** (<https://www.red-seal.ca/eng/trades/plumbers/overview.shtml>) – National certification program with exam prep guides and trade mobility information.
- **BC Building Codes & Standards** (<https://www.bccodes.ca/>) – Official building and plumbing codes for British Columbia.

Workplace Safety & Regulations

- **WorkSafeBC** (<https://www.worksafebc.com/en>) – Essential safety resources for plumbers, including:
 - Health & Safety – WorkSafeBC (<https://www.worksafebc.com/en/health-safety>)
 - Report Unsafe Working Conditions (<https://www.worksafebc.com/en/contact-us/departments-and-services/health-safety-prevention>)
 - Report a Workplace Injury or Disease (<https://www.worksafebc.com/en/claims/report-workplace-injury-illness>)
 - Submit a Notice of Project Form (<https://www.worksafebc.com/en/for-employers/just-for-you/submit-notice-project>)
 - Get Health and Safety Resources (Videos, Posters, Publications, and More) (<https://www.worksafebc.com/en/resources-health-safety>)
 - Search the OHS Regulations (and Related Materials) (<https://www.worksafebc.com/en/law-policy/occupational-health-safety/searchable-ohs-regulation>)
 - Conduct an Incident Investigation (<https://www.worksafebc.com/en/health-safety/create-manage/incident-investigations/conducting-employer-investigation>)
- **CCOHS: OHS Answers Fact Sheets – Plumber** (https://www.ccohs.ca/oshanswers/occup_workplace/plumber.html) – Safety guidelines and best practices for plumbers in various work environments.

Financial Supports

- **Financial Support (SkilledTradesBC)** (<https://skilledtradesbc.ca/financial-support>) – Information about grants, tax credits, Canada apprentice loans, employment insurance, and the Indigenous Skills and Employment Training

(ISET) program.

- **StudentAidBC** (<https://studentaidbc.ca/>) – Complete post-secondary education through student loans, grants, and scholarships. There is also programs that help with loan repayment.
- **WorkBC (Government of BC)** (<https://www.workbc.ca/find-loans-and-grants/students-and-adult-learners/services-apprentices-and-employers>) – Services for apprentices and employers.

Mental Health & Wellness Support

- **HealthLink BC – Mental Health and Substance Use** (<https://www.healthlinkbc.ca/mental-health-and-substance-use>) – HealthLink BC resources for mental health and wellness support.
- **Here2Talk** (<https://here2talk.ca/>) – Free and confidential counseling services available to all post-secondary students registered at a BC school.
- **Help Starts Here** (<https://helpstartshere.gov.bc.ca/>) – A database with over 2,500 listings of services related to mental health and substance use supports.
- **Hope for Wellness Helpline** (<https://www.hopeforwellness.ca/>) – 24/7 online chat and phone line with experienced and culturally competent counselors available to all Indigenous people in Canada.
 - First Nations Health Authority Mental Health Supports Info Sheet [PDF] (<https://www.fnha.ca/Documents/FNHA-mental-health-and-wellness-supports-for-indigenous-people.pdf>) by First Nations health Authority – List of culturally safe services for Indigenous people.
- **HeretoHelp – BC** (<https://www.heretohelp.bc.ca/>) – Mental health resources, including videos, articles, and support services in BC.
- **BC Construction Industry Rehabilitation Plan** (<https://www.constructionrehabplan.com/>) – Mental health and substance use services for CLRA and BCBT members and their families.
- **Virtual Mental Health Supports (Government of BC)** (<https://www2.gov.bc.ca/gov/content/health/managing-your-health/mental-health-substance-use/virtual-mental-health-supports>) – Virtual services are available for British Columbians who are experiencing anxiety, depression, or other mental health challenges.

Crisis Support

- **Interior Crisis Line Network** – Call 1-888-353-2273 (tel:+1-888-353-2273) for 24/7 emotional support, crisis intervention, and community resource information.
- **Talk Suicide Chat Service** (<https://talksuicide.ca/>) – An alternative if calling is difficult; available for crisis intervention.
- **310Mental Health Support** – Call 250-310-6789 (tel:+1-250-310-6789) for emotional support, information, and resources specific to mental health.
- **1-800-SUICIDE** – Call 1-800-784-2433 (tel:+1-800-784-2433) if you are experiencing feelings of distress or despair, including thoughts of suicide.
- **Opioid Treatment Access Line** – Call 1-833-804-8111 (tel:+1-833-804-8111) between 9 am and 4 pm to connect with a doctor, nurse, or healthcare worker who can prescribe opioid treatment medication that same day.
- **KUU-US Crisis Response Service** – Call 1-800-588-8717 (tel:+1-800-588-8717) for culturally-aware crisis support for Indigenous peoples in BC.
- **Alcohol and Drug Information and Referral Service** – Call 1-800-663-1441 (tel:+1-800-663-1441) to find resources and support.



Emergency Services — For life-threatening situations, call 911 or visit your nearest emergency department.