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PURPOSE

The Oxidizing Materials Standard contains information on the safe use, handling and storage of oxidizing materials at the University of Calgary to protect people, assets and the environment. The Standard may be used in the development of site-specific Standard Operating Procedures (SOPs). As a minimum, this guiding document needs to be reviewed by all staff prior to commencing work with oxidizing materials. This Standard addresses the Occupational Health and Safety Code requirements for safety equipment and emergency response when working with oxidizing materials.

SCOPE

This Standard applies to all persons that are handling, using, storing and/or disposing oxidizing materials under the auspices of the University of Calgary. Oxidizing materials are labelled according to either WHMIS 1988 or WHMIS 2015 requirements, to clearly indicate their contents. The symbols for oxidizing materials are as follows:



WHMIS 1988



WHMIS 2015

PROPERTIES

- Oxidizing materials can be liquids, solids, or gases and can affect the eyes, skin, mucous membranes and respiratory tract.
- Oxidizing materials speed up the development and intensity of fires.
- Oxidizing materials cause substances that do not normally burn readily in air to burn rapidly.
- Oxidizing materials cause combustible materials to burn spontaneously without the presence of ignition sources.
- Organic peroxides readily release oxygen and may be, liable to explosive decomposition, or sensitive to heat, shock or friction.
- Crystals found in solvents known to form peroxides (e.g. ethers) can be very hazardous and are potentially explosive.

- Oxidizing materials are **Class 5.1 Oxidizers** and **5.2 Organic Peroxides** dangerous goods as defined by the Transportation of Dangerous Goods (TDG) Act.
- The US National Fire Protection Association (NFPA) classifies oxidizing materials into four classes, of increasing risk, based on their ability to cause spontaneous combustion and increased burning rate.

NFPA Oxidizer Classes	Examples
<p>Class 1 Oxidizers:</p> <ul style="list-style-type: none"> • Slightly increase the burning rate of combustible materials. • Do not cause spontaneous ignition when in contact with combustible materials. 	<ul style="list-style-type: none"> • Hydrogen peroxide solutions (8% to 27.5% by wt.) • Nitric acid (40% concentration or less) • Perchloric acid solutions (less than 50% by wt.)
<p>Class 2 Oxidizers:</p> <ul style="list-style-type: none"> • Moderately increase the burning rate of combustible materials. • May cause spontaneous ignition when in contact with combustible materials. 	<ul style="list-style-type: none"> • Hydrogen peroxide solutions (27.5% to 52% by wt.) • Nitric acid (conc. greater than 40% & less than 86%) • Potassium permanganate
<p>Class 3 Oxidizers:</p> <ul style="list-style-type: none"> • Severely increase the burning rate of combustible materials. • Will cause sustained and vigorous decomposition when in contact with combustible materials or if exposed to sufficient heat. 	<ul style="list-style-type: none"> • Hydrogen peroxide solutions (52% to 91% by wt.) • Nitric acid, fuming (concentration greater than 86%) • Perchloric acid solutions (60% to 72% by wt.)
<p>Class 4 Oxidizers:</p> <ul style="list-style-type: none"> • Can explode, when in contact with certain contaminants. • Can explode if exposed to slight heat, shock, or friction. • Will increase the burning rate of combustible materials. • Can cause combustible materials to ignite spontaneously. 	<ul style="list-style-type: none"> • Hydrogen peroxide solutions (greater than 91% by wt.) • Perchloric acid solutions (greater than 72.5% by wt.) • Ammonium permanganate • Tetranitromethane • Ammonium perchlorate (particle size greater than 15 microns)

- Oxidizing materials under **WHMIS 1988** legislation are classified as **Class C Oxidizing Material**.
- Oxidizing materials under **WHMIS 2015** legislation are classified in **Part 7 Physical Hazard Classes**: Oxidizing Liquids - Category 1 to 3, Oxidizing Solids Category 1 to 3.

RESPONSIBILITIES

Supervisors

- Complete a Hazard Assessment and Control Form (HACF) that identifies the hazards of working with oxidizing materials and the controls used to mitigate the hazards.
- Communicate the hazards and appropriate controls to workers.
- Provide appropriate Personal Protective Equipment (PPE).
- Develop a Standard Operating Procedure (SOP) for the use, handling, storage and movement of oxidizing materials in your work area.
- Train staff in accordance to this Standard and any laboratory specific procedures involving oxidizing materials and ensure compliance.
- Maintain an inventory list of oxidizing materials.

Workers

- Review this Standard and the applicable Safety Data Sheet (SDS) prior to working with oxidizing materials.
- Follow the requirements set out in this Standard, the HACF for your laboratory, and any laboratory specific SOPs.
- Report hazardous conditions immediately to their supervisor.
- Know the location of emergency equipment and how to respond to an emergency.
- Wear and properly maintain the required Personal Protective Equipment (PPE).
- Wear appropriate laboratory attire including long pants and closed-toe shoes.

Facilities

- Develop and implement University of Calgary Design Standards compliant with appropriate legislation, codes, standards and best practices affecting construction and renovations in areas where oxidizing materials will be used or stored.
- Installation of appropriate eyewash and emergency showers based on risk assessment, as per the University of Calgary Design Standards.

Environmental Health and Safety

- The development and review of this Standard.
- Advise users on appropriate legislation, codes, standards and best practices for use, handling and storage of oxidizing materials.
- Assist departments with interpretation and methods of compliance with this Standard.

USAGE

Oxidizing materials are present in a wide range of products with varying properties and use. The hazards associated with oxidizing materials are heavily dependent on the concentration and route of exposure. The following are general guidelines for oxidizing materials. The SDS should be consulted for the specific hazards and controls prior to use.

- Industry best practice is to purchase oxidizing materials in the smallest quantity practical for the application.
- All procedures involving oxidizing materials that create gases, dusts, vapours or mists must be conducted in a chemical fume hood to prevent oxidation reactions.
- An eyewash and emergency shower must be installed as per the University of Calgary Design Standards where oxidizing materials are being used.

- A spill kit must be available in the location where oxidizing materials are used. Please refer to UofC EHS Spill Kit information to ensure your lab space is properly equipped for chemical spills.
- Check the SDS for the appropriate type of glove.
- Always wear appropriate personal protective equipment (PPE) and appropriate laboratory attire when working with oxidizing materials.
- Use chemical splash goggles and face shield when there is a risk of splash from oxidizing materials.
- If a respirator is required, the user must follow the UofC EHS Respiratory Protection Program.
- Replace damaged or obsolete product labels as appropriate.
- When handling containers with oxidizing materials the outside should be wiped down before and after use with a dry paper towel. Dispose of paper towel as contaminated waste.
- When pouring oxidizing materials ensure the label is turned up so that any residual material does not come into contact with the label.
- Decontaminate surfaces and equipment that may have been exposed to oxidizing materials. Dispose of cleaning materials as chemically contaminated waste.
- Dispose of gloves as contaminated waste.
- Hands should be washed promptly after the use of any oxidizing materials.

HANDLING

Movement within a facility

- Movement of oxidizing materials must adhere to the UofC EHS Movement of Hazardous Materials Within Buildings document.

Transport on Road

- Transportation of hazardous materials is subject to Transportation of Dangerous Goods (TDG) legislation and University of Calgary procedures. Private vehicles should not be used to transport dangerous goods. Contact Supply Chain Management for assistance when transport of oxidizing materials between buildings or between campuses is required.

Waste/Disposal

- Never dispose of oxidizing materials down any plumbing system.
- Follow the UofC EHS Hazardous Materials Disposal Manual.

STORAGE

Users of oxidizing materials must maintain their inventory as low as reasonably practical adhering to the requirements of this Standard for storage of oxidizing materials.

- Chemicals must be segregated according to the chemical storage guidelines provided by the manufacturers' SDS.
- All storage areas containing oxidizing materials must be appropriately labelled.
- Oxidizing materials should always be stored in an upright position.
- Oxidizing materials should always be stored and used in well-ventilated areas.
- Do not store containers of oxidizing materials in high traffic areas or near floor drains.
- Containers of oxidizing materials should be assessed for peroxide formation/potentially explosive compounds (PECs) and container integrity at least annually.

EMERGENCY PROCEDURES

First Aid

- Provide first aid in accordance with the Safety Data Sheet.
- Contact Campus Security 403-220-5333, if additional first aid treatment is needed.
- Contact supervisor and follow the University of Calgary Incident Reporting and Investigation instructions on the EHS website.

Spill Procedures

- Ensure that you have an adequate spill kit for oxidizing materials.
- Follow the UofC EHS Spill Response Procedures.

REFERENCES

Alberta Occupational Health and Safety Act, Regulations and Code

UofC EHS Chemical Storage Guidelines

UofC EHS Emergency Station Compliance Program

UofC EHS Hazardous Materials Disposal Manual

UofC EHS Movement of Hazardous Materials Within Buildings

UofC EHS Respiratory Protection Program

UofC EHS Spill Kit Information

UofC EHS Spill Response Procedures

University of Calgary Codes of Practice

University of Calgary Design Standards