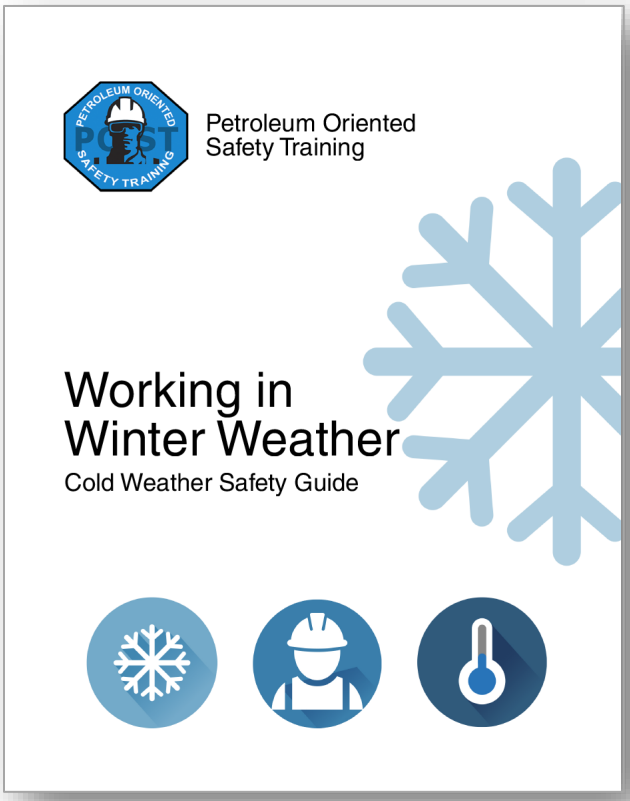
Petroleum Oriented
Safety Training

Working in Winter Weather

Cold Weather Safety Guide





Petroleum Oriented Safety Training

www.POSTtraining.ca info@posttraining.ca

Toll-Free 1-866-360-6722

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CONTENTS

1 Introduction 3
2 Equipment 3
2.1 Design 3
2.2 Maintenance 3
3 Safe Work Practices 4
3.1 Surveillance and Monitoring 4
3.2 Communications 4
4 Emergency Procedures & First Aid 5
4.1 First Aid Treatment 5
4.2 Signs of hypothermia 5
4.3 Education 5
5 Clothing 6
5.1 Protective Clothing 6
5.2 Footwear 6
5.3 Socks 6
5.4 Face and Eye Protection 6
6 Winter walking 7
6.1 Slips, Trips and Falls 7
Appendix A -Warm-up break schedule for outdoor work in cold conditions 9
Appendix B - Guideline for preparing an Emergency Kit 10
Appendix C - If You Get Caught In A Winter Storm 11
Appendix D – Wind Chill Chart 12
Appendix E – Infographic 13

1 INTRODUCTION

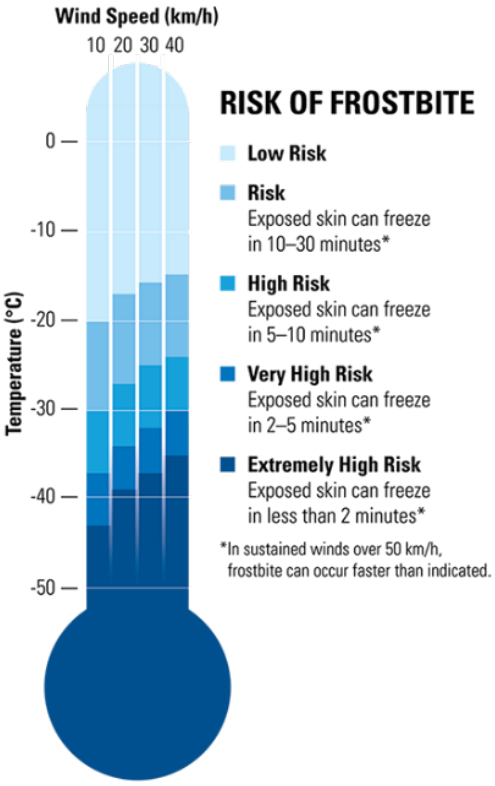
As winter weather is here for most of us in Canada, it is important to know the effects of working outside in cold weather including the risk of cold related injuries. This guide includes tips to mitigate cold weather-related injuries including how to identify hypothermia, proper clothing, and emergency procedures.

At very cold temperatures, the most serious concern is the risk of hypothermia or dangerous overcooling of the body. Another serious effect of cold exposure is frostbite or freezing of the exposed extremities such as fingers, toes, nose and ear lobes. Hypothermia could be fatal in absence of immediate medical attention.

The risk of cold injury can be minimized by

- proper equipment design and maintenance
- safe work practices
- emergency plans and procedures and
- appropriate clothing
- Equipment
- Design

For work below the freezing point, metal handles and bars should be covered by thermal insulating material. Also, machines and tools should be designed so that they can be operated without having to remove mittens or gloves.



Adapted from Environment Canada's Wind Chill Index:
http://www.ec.gc.ca/meteo-weather/default.asp?lang=En&n=5FBF816A-1

2 EQUIPMENT

2.1 DESIGN

For work below the freezing point, metal handles and bars should be covered by thermal insulating material. Also, machines and tools should be designed so that they can be operated without having to remove mittens or gloves.

2.2 MAINTENANCE

Equipment is prone to mechanical breakdown during cold temperatures. In extreme weather conditions such a breakdown can be life threatening. It is, therefore, prudent to take care to ensure that equipment is in good working order. As the temperature decreases, more stringent standards of safety will apply:

Air Temperatures from 0°C to -20°C: To avoid accidents and breakdowns, all equipment must be checked at the start of each working day and every eight hours thereafter.

Air Temperatures from -20°C to -45°C: All equipment must be checked at the start of each working day and every four hours thereafter.

Air Temperatures -45°C and Below: Normally, all outdoor work will cease.

In the event of an emergency such as natural disasters, rescue operations and situations that threaten public safety, work must proceed with extreme caution. Equipment checks must be carried out hourly.

Use caution when handling gasoline. With a freezing point of -56°C (-70°F) and a high evaporation rate, contact with the skin can be very dangerous. Similarly, caution should be exercised when handling metal objects. Always wear gloves or mitts rather than touch the object directly.

3 SAFE WORK PRACTICES

3.1 SURVEILLANCE AND MONITORING

Every workplace where the temperature may fall below 16°C should be equipped with a suitable thermometer to monitor any further temperature changes. For colder workplaces with temperatures below the freezing point, the temperature should be monitored at least every 4 hours. For indoor workplaces, whenever the rate of air movement exceeds 2 meters per second (5 miles per hour) it should be recorded every 4 hours. In outdoor workplaces with air temperature below the freezing point, both air temperature and wind speed should be recorded.

Warm-up Breaks – The table in Appendix A on page 8 shows warm-up break schedules for outdoor work in cold conditions. It assumes that under normal warm weather working conditions, breaks are scheduled at two-hour intervals. The schedule provides for additional breaks as the wind velocity at the work site increases and/or the temperature decreases. If effective protection from the wind can be achieved by shields or screens or by modifying or relocating work, then temperature alone can be considered. Where the work itself generates wind (i.e. driving or riding on an unshielded vehicle), this should be taken into account.

The tolerance of individuals to cold varies widely. In all cases, common sense should be taken into consideration to determine individual limitations.

Awareness – A major defence against serous cold injury is awareness of the danger. When working with others watch for potential danger or signs of injury. In turn, make sure that your co-workers are looking out for you. Periodic checks of face and ears can identify a potential frostbite problem before it becomes serious. Look for disorientation or clumsiness in yourself or others, which could be a sign of hypothermia.

3.2 COMMUNICATIONS

Working alone should be avoided when cold weather is potentially a danger. However, if this is not possible a “buddy” system must be used. This means that a person working alone should be able to always contact another person by radio or phone on an open channel. Supervisors are to clearly lay out the communications plan prior to starting work so everyone is clear on the work and what happens during an emergency.

4 EMERGENCY PROCEDURES & FIRST AID

Procedures for providing first aid and obtaining medical care should be clearly outlined. For each shift, at least one trained person should be assigned the responsibility of attending to emergencies.

4.1 FIRST AID TREATMENT

It is important to recognize the early symptoms of cold injury. As the body cools, discomfort is first felt at the extremities such as fingers and toes. Shivering follows this discomfort. This is a warning that the body must be warmed, either in a warm shelter or, in some circumstances, by more vigorous activity. The activity should not be so great as to cause sweating. If the warning is ignored, then the result can be serious injury such as frostbite or hypothermia.

> ***Hypothermia*** *– Hypothermia is a condition that results from the cooling of the body at a rate that exceeds the body's ability to generate warmth. This can occur slowly, as in the case of a person who has put in a full day of work under cold conditions and is in need of food and rest to allow the body to restore normal body core temperature. It can also occur quickly, as in the case of a person who has fallen through ice into frigid water.*

4.2 SIGNS OF HYPOTHERMIA

Typical signs and symptoms of hypothermia include:

- Increasing slowness of physical and mental response;
- Stumbling, cramps and shivering;
- Slurring of speech;
- Impaired vision;
- Unreasonable behaviour or irritability; and
- Increased pulse and respiration as long as the body can still respond by shivering.

4.3 EDUCATION

Workers and supervisors involved with work in cold environments should be informed about symptoms of adverse effect exposure to cold, proper clothing habits, safe work practices, physical fitness requirements for work in cold, and emergency procedures in case of cold injury. While working in cold, a buddy system should be used. Look out for one another and be alert for the symptoms of hypothermia.

5 CLOTHING

5.1 PROTECTIVE CLOTHING

Protective clothing is needed for work at or below 4°C. Clothing should be selected to suit the temperature, weather conditions (e.g., wind speed, rain), the level and duration of activity, and job design. These factors are important to consider so that you can regulate the amount of heat and perspiration you generate while working. If the work pace is too fast or if the type and amount of clothing are not properly selected, excessive sweating may occur. The clothing next to body will become wet and the insulation value of the clothing will decrease dramatically. This increases the risk for cold injuries.

- Clothing should be worn in multiple layers which provide better protection than a single thick garment.
- The inner layer should provide insulation and be able to "wick" moisture away from the skin to help keep it dry.
- The additional layers of clothing should provide adequate insulation for the weather conditions under which the work being done.
- For work in wet conditions, the outer layer of clothing should be waterproof.
- Almost 50 percent of body heat is lost through the head. A wool knit cap or a liner under a hard hat can reduce excessive heat loss.
- Clothing should be kept clean since dirt fills air cells in fibres of clothing and destroys its insulating ability.
- Clothing must be dry. Moisture should be kept off clothes by removing snow prior to entering heated shelters.
- If fine manual dexterity is not required, gloves should be used below 4°C for light work and below -7°C for moderate work. For work below -17°C, mittens should be used.
- Cotton is not recommended. It tends to get damp or wet quickly and loses its insulating properties. Wool and synthetic fibres, on the other hand, do retain heat when wet.

5.2 FOOTWEAR

Felt-lined, rubber bottomed, leather-topped boots with removable felt insoles are best suited for heavy work in cold since leather is porous, allowing the boots to "breathe" and let perspiration evaporate. Leather boots can be "waterproofed" with some products that do not block the pores in the leather.

5.3 SOCKS

You may prefer to wear one pair of thick, bulky socks or two pairs - one inner sock of silk, nylon, or thin wool and a slightly larger, thick outer sock. Liner socks made from polypropylene will help keep feet dry and warmer by wicking sweat away from the skin. However, as the outer sock becomes damper, its insulation properties decrease. If work conditions permit, have extra socks available so you can dry your feet and change socks during the day. If two pairs of socks are worn, the outer sock should be a larger size so that the inner sock is not compressed.

5.4 FACE AND EYE PROTECTION

In extremely cold conditions, where face protection is used, eye protection must be separated from the nose and mouth to prevent exhaled moisture from fogging and frosting eye shields or glasses. Select

protective eye wear that is appropriate for the work you are doing, and for protection against ultraviolet light from the sun, glare from the snow, blowing snow/ice crystals, and high winds at cold temperatures.

6 WINTER WALKING

We may not think about this, but slippery conditions caused by ice and snow is as much of a hazard as slippery conditions caused by other elements you may be used to mitigating in your everyday working environment (e.g. oil, grease, water etc.).

Ice grips or ice cleats as they are both know by are a good way to mitigate the risk of a nasty slip and/or fall due to icy conditions. Ice grips should be part of a worker's PPE during the winter months if they are exposed to the risk.

Ice grips on footwear can help you walk on hard packed snow and ice. But be careful, as they become dangerously slippery and must be removed before walking on smooth surfaces such as stone, tile and ceramic. Before buying the grippers, be sure that you are able to attach and remove them from your boots.

Another option is to look for ice grippers that can be worn indoors as well. This is more convenient for maintenance and delivery personnel as it is not very practical to remove them at the door before entering a building.

6.1 SLIPS, TRIPS AND FALLS

As temperatures drop and snow flies, the number of injuries due to slips, trips, and falls increases. Workers can suffer bruises, abrasions, broken limbs, cracked ribs, serious back and/or head injuries, often resulting in time off work. In Canada, more than 42,000 workers get injured annually due to falls, according to the Canadian Centre for Occupational Health and Safety. Statistics show the majority (66%) are due to slips and trips on the same level. The remaining (34%) are falls from heights, such as ladders, stairs, or roofs.

Slip, trip and fall hazards

- Uneven surfaces
- Untreated surfaces during adverse weather conditions (e.g., snow)
- Slippery surfaces (e.g., spilled oil)
- Bad housekeeping – objects not cleared up after use and untidy cables, wires and ropes etc.
- Incautious walking – lack of awareness of potentially hazardous objects present

How to control slip, trip and fall hazards (Indoors and outdoors):

- Conduct frequent hazard spotting. (trailing cables, obstructions or damaged floors)
- Report potential incidents and immediately correct situation

• Ensure training on slip/trip/falls and competency of workers and equip them with the proper PPE

• Avoid work on outdoors during bad weather.

• Avoid slippery surface and establish safe working areas (add salt in case of snow or ice or use sand to absorb oil spills).

• Practice good housekeeping (remove obstruction in walkways, passageways, and fire exits).

• Exercise caution when walking over washed or waxed floors.

• When using stairs keep a firm hold of the handrail, especially when descending.

THE ART OF FALLING

It may sound impossible, but if you can control your fall you can lessen the chance and severity of injury.

1. Tuck your chin in, turn your head, and throw an arm up. It is better-to land on your arm than on your head.

2. While **falling**, twist or roll your body to the side.

3. Keep your wrists, elbows and knees bent.

THE "PENGUIN" WALK

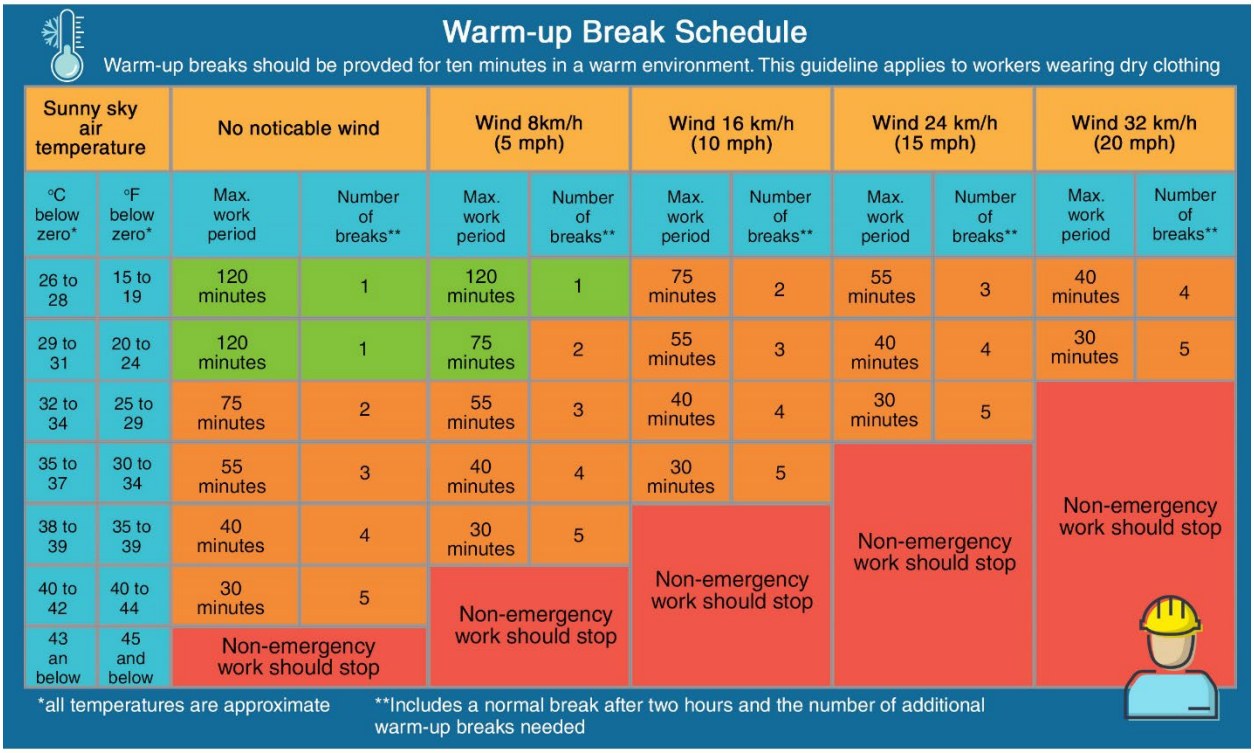
When walking on slippery surfaces, especially ice, walking "like a penguin" actually keeps you in a position to lessen your chance of slipping and falling.

- Bend slightly and **walk** flat footed.
- Keep your center of gravity over your feet as much as possible.
- Point your feet out slightly – well, **like a penguin**. Shuffle your feet and take short steps.
- Watch where you are stepping. - Concentrate on keeping your balance.
- Keep your arms at your sides and hands out of your pockets. **- Go slow.**

APPENDIX A -WARM-UP BREAK SCHEDULE FOR OUTDOOR WORK IN COLD CONDITIONS

Work/rest schedule

The "work warm-up schedule," as developed by the Saskatchewan Occupational Health and Safety Division shows the warm-up breaks required for working in cold conditions and the normal breaks to be provided every two hours. The schedule allows additional breaks for workers as the wind velocity at the work site increases and/or the temperature drops.



Warm-up Break Schedule

Warm-up breaks should be provded for ten minutes in a warm environment. This guideline applies to workers wearing dry clothing

Sunny sky air temperature		No noticable wind		Wind 8km/h (5 mph)		Wind 16 km/h (10 mph)		Wind 24 km/h (15 mph)		Wind 32 km/h (20 mph)	
°C below zero*	°F below zero*	Max. work period	Number of breaks**	Max. work period	Number of breaks**	Max. work period	Number of breaks**	Max. work period	Number of breaks**	Max. work period	Number of breaks**
26 to 28	15 to 19	120 minutes	1	120 minutes	1	75 minutes	2	55 minutes	3	40 minutes	4
29 to 31	20 to 24	120 minutes	1	75 minutes	2	55 minutes	3	40 minutes	4	30 minutes	5
32 to 34	25 to 29	75 minutes	2	55 minutes	3	40 minutes	4	30 minutes	5	Non-emergency work should stop	
35 to 37	30 to 34	55 minutes	3	40 minutes	4	30 minutes	5	Non-emergency work should stop			
38 to 39	35 to 39	40 minutes	4	30 minutes	5	Non-emergency work should stop					
40 to 42	40 to 44	30 minutes	5	Non-emergency work should stop							
43 an below	45 and below	Non-emergency work should stop									

*all temperatures are approximate

**Includes a normal break after two hours and the number of additional warm-up breaks needed

Important: This is a guideline only. Common sense should override strict application of this guide.

APPENDIX B - GUIDELINE FOR PREPARING AN EMERGENCY KIT

All vehicles should be outfitted with emergency gear as a precaution against vehicle breakdown or sudden changes in weather or road conditions. Drivers should routinely check to see that their vehicles are equipped with:

✓	✓
Reflectors or flares	Maps
Shovel	Mirror
Hatchet, axe or saw	Newspaper
Tow strap or rope	Toilet paper, paper towels
Basic tool kit	Small metal can, jug
Jumper cables	Matches (strike anywhere)
Flashlight, candles	Knife
First aid kit	Rope, wire
Personal survival kit	Sleeping bag or blankets
Food (MRE's, protein bars)	

APPENDIX C - IF YOU GET CAUGHT IN A WINTER STORM

It is advised to stay indoors during a winter storm at all costs. However, certain situations may arise that you have to go outdoors. If you do and get caught, below are some basic survival tips. Please review the tips for preparing before the storm to reduce your risks.

OUTSIDE

- Find shelter: try to stay dry, cover all exposed parts of the body.
- No shelter: prepare a lean-to, wind-break, or snow cave for protection from the wind.
- Build a fire for heat and to attract attention; place rocks around the fire to absorb and reflect heat.
- Do not eat snow: It will lower your body temperature. Melt it first.
- Watch for signs of frostbite and hypothermia.

IN A CAR OR TRUCK

- Stay in your car or truck. Do not leave the car to search for assistance unless help is visible within 100 yards. You may become disoriented and lost is blowing and drifting snow.
- Run the motor about ten minutes each hour for heat; open the window a little for fresh air to avoid carbon monoxide poisoning, make sure the exhaust pipe is not blocked.
- Make yourself visible to rescuers; turn on the dome light at night when running engine, tie a colored cloth (preferably red) to your antenna or door, raise the hood indicating trouble after snow stops falling.
- Exercise from time to time by vigorously moving arms, legs, fingers, and toes to keep blood circulating and to keep warm.
- Watch for signs of frostbite and hypothermia.
- For warmth, huddle together.
- Use newspapers, maps, and even the removable car mats for added insulation.

AT HOME OR IN A BUILDING

- Stay inside. When using ALTERNATIVE HEAT from a fireplace, wood stove, space heater, etc.; use fire safeguards, properly ventilate.
- No heat; close off unneeded rooms, stuff towels or rags in cracks under doors, cover windows at night.
- Eat and drink. Food provides the body with energy for producing its own heat. Keep the body replenished with fluids to prevent dehydration.
- Wear layers of loose-fitting, lightweight, warm clothing. Remove layers to avoid overheating, perspiration, and subsequent chill.

APPENDIX D – WIND CHILL CHART

WIND CHILL TEMPERATURE INDEX
Frostbite Times are for Exposed Facial Skin

Air Temperature (°C)

Wind Speed (km/h)	5	0	-5	-10	-15	-20	-25	-30	-35	-40	-45	-50
5	4	-2	-7	-13	-19	-24	-30	-36	-41	-47	-53	-58
10	3	-3	-9	-15	-21	-27	-33	-39	-45	-51	-57	-63
15	2	-4	-11	-17	-23	-29	-35	-41	-48	-54	-60	-66
20	1	-5	-12	-18	-24	-30	-37	-43	-49	-56	-62	-68
25	1	-6	-12	-19	-25	-32	-38	-44	-51	-57	-64	-70
30	0	-6	-13	-20	-26	-33	-39	-46	-52	-59	-65	-72
35	0	-7	-14	-20	-27	-33	-40	-47	-53	-60	-66	-73
40	-1	-7	-14	-21	-27	-34	-41	-48	-54	-61	-68	-74
45	-1	-8	-15	-21	-28	-35	-42	-48	-55	-62	-69	-75
50	-1	-8	-15	-22	-29	-35	-42	-49	-56	-63	-69	-76
55	-2	-8	-15	-22	-29	-36	-43	-50	-57	-63	-70	-77
60	-2	-9	-16	-23	-30	-36	-43	-50	-57	-64	-71	-78
65	-2	-9	-16	-23	-30	-37	-44	-51	-58	-65	-72	-79
70	-2	-9	-16	-23	-30	-37	-44	-51	-58	-65	-72	-80
75	-3	-10	-17	-24	-31	-38	-45	-52	-59	-66	-73	-80
80	-3	-10	-17	-24	-31	-38	-45	-52	-60	-67	-74	-81

FROSTBITE GUIDE

Increasing risk of frostbite for most people in 10 to 30 minutes of exposure
High risk for most people in 5 to 10 minutes of exposure
High risk for most people in 2 to 5 minutes of exposure
High risk for most people in 2 minutes of exposure or less

APPENDIX E – INFOGRAPHIC

The following infographic is provided by the Canadian Centre for Occupational Health & Safety (CCOHS).

The infographic can be printed and posted alongside this guide.

- Office bulletin board
- Worksite trailer

If you would like to print it in a larger size, a downloadable version is available on the POST and/or the CCOHS website.

https://posttraining.ca/winter-safety/

Guide Resources:

- Canadian Centre for Occupational Health and Safety
- Environment & Climate Change Canada
- Government of Northwest Territories
- Saskatchewan Occupational Health and Safety