Tips for working in cold environment

- Use a buddy system to look out for one another.
- Be alert to symptoms of hypothermia in others. Victims are generally not able to notice their own condition.
- For work below 0°C, metal handles and bars should be covered by thermal insulating material. Machine and tool design should allow operation while wearing mittens or gloves.
- Wear suitable protective clothing for work at or below 4°C.
- Workplaces where the temperature may fall below 16°C should be equipped with a suitable thermometer to monitor temperature changes. The temperature in workplaces below 0°C should be monitored every 4 hours.
- Indoor workplace where air movement exceeds 2 metres per second, should record the wind speed every 4 hours. Outdoor workplaces below 0°C should monitor both temperature and wind speed.
- Have clear procedures for providing and obtaining medical care.
- For each shift have at least one trained person on duty assigned to attend to emergencies.
- Workers and supervisors in cold environments should be informed on symptoms and injuries from cold exposure, proper clothing, safe work practices, physical fitness and emergency procedures.
- Clothing should provide insulation and protection but also be easy to open/loosen to prevent excessive sweating (Cotton is not recommended as it gets damp quickly and loses its insulating properties. Wool and some synthetic fibres retain heat when wet.)
- Wear rubber-bottomed, leather-topped boots with removable felt insoles for heavy work in cold weather. Leather allows the boots to breathe.
- Wear polypropylene liner socks to keep feet dry and warm.
- When wearing eye protection in extreme cold, ensure it is separate from your nose and mouth cover to prevent exhaled moisture from fogging/frosting your eye shields.
- Eye goggles/glasses should protect against UV, glare, blowing snow/ice and high winds.
- The air speed in refrigerated rooms should not exceed 1 metre per second.
- Workers exposed simultaneously to cold, vibration and/or toxic substances may require reduced limits for cold exposure.
- Stay hydrated, especially during strenuous work.
- Warm up by drinking warm non-alcoholic beverages or soup. Avoid caffeinated drinks as that can contribute to dehydration.

No current regulation/legislation in Canada

Visit Worksafe Saskatchewan for full details of their Work Warm-up Schedule.

http://www.worksafesask.ca/prevention/environmental-risks/working-in-cold-weather/

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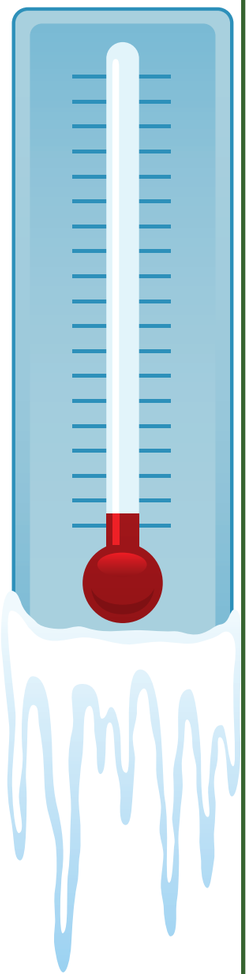
Health & Safety Insights

Environmental Conditions

WORKING IN COLD ENVIRONMENTS

Working in Cold Environments



Cold working environments are challenging. Three factors affect how we experience the cold: air temperature, air movement/wind speed, and humidity. To work safely, these factors must be mitigated through layered protective clothing, physical activity and controlled exposure.

The combination of cold air and wind speed is called the Equivalent Chill Temperature (ECT), or wind chill. We naturally feel colder as wind speed increases and this effect increases dramatically when that wind is even colder than the air temperature. Wind chill numbers provide a good guideline for deciding proper clothing and protective equipment to wear as well as the length of time someone should be exposed to that temperature.

WIND CHILL CHART

		Ambient Temperature °C								
		4	-1	-7	-12	-18	-23	-29	-34	-40
Wind km/h	Velocity mph	Equivalent Chill Temperature °C								
Calm										
0	0	4	-1	-7	-12	-18	-23	-29	-34	-40
8	5	3	-3	-9	-14	-21	-26	-32	-38	-44
16	10	-2	-9	-16	-23	-30	-35	-43	-50	-57
24	15	-6	-13	-20	-28	-36	-43	-50	-58	-65
32	20	-8	-16	-23	-32	-39	-47	-55	-63	-71
40	25	-9	-18	-26	-34	-42	-51	-59	-67	-76
48	30	-16	-19	-22	-36	-44	-53	-62	-70	-78
56	35	-11	-20	-29	-37	-46	-55	-63	-72	-81
64	40	-12	-21	-29	-38	-47	-56	-65	-73	-82

Little danger in less than one hour exposure of dry skin.

DANGER - Exposed flesh freezes within one minute

GREAT DANGER - Flesh may freeze within 30 seconds

Maximum danger of false sense of security

Adapted from: Threshold Limit Values (TLV™) and Biological Exposure Indeces (BEI™) booklet; published by ACGIH, Cincinnati, Ohio

Effects of cold exposure

Toes, fingers, ears and noses are prone to cold. The body also conserves heat for your internal organs and therefore reduces blood flow to your extremeties. Your feet and hands are affected by this and are also more likely to be in contact with cold surfaces. Your eyes should also be protected by goggles to prevent your corneas from freezing.

Cold Exposure Injuries

Chilblains
Affected areas will be red, swollen, tingly and painful. Chilblains can occur from prolonged and repeated exposure to temperatures from 0°C to 16°C.

Immersion Foot
This occurs when your feet have been wet, but not freezing, for extended periods of time. It primarily affects your nerves and muscle tissue, and symptoms include tingling, numbness, itching, pain, swelling of the feet, legs and hands, and blisters. Your skin might be red initially and then turn blue or purple as the injury progresses. Gangrene can develop in severe cases.

Trench Foot
This injury is similar to Immersion Foot but occurs in colder temperatures over shorter periods of exposure. The onset of symptoms can take several hours but the average is three days. Your hands can also be affected by this type of injury if you wear wet gloves for a prolonged period in cold conditions.

Frostnip
This is the mildest type of skin freezing injury. Frostnip occurs when the top layer of skin on your ear lobes, nose, cheeks, fingers or toes freezes due to exposure to the cold. The affected area turns white, might feel numb, and the outer layer of skin will feel hard while the deeper tissue remains soft/normal.

Frostbite
This common injury occurs through exposure to extreme cold, contact with extremely cold objects (particularly those made of metal), or contact with cooled or compressed gases. With frostbite, the temperature of your tissue in the affected areas falls below the freezing point and your blood flow is obstructed.

Hypothermia
This severe injury occurs from excessive loss of body heat and the resulting lowered core temperature of your body, which can be fatal. The chart below defines the range of temperatures at which the stages of hypothermia can occur and the symptoms of those stages.

What are the signs of hypothermia?

Stage	Core Temperature	Signs & Symptoms
Mild Hypothermia	37.2-36.1ºC	Normal, shivering may begin.
	36.1-35ºC	Cold sensation, goose bumps, unable to perform complex tasks with hands, shivering can be mild to severe, hands numb.
Moderate Hypothermia	35-33.9ºC	Shivering, intense, muscles incoordination becomes apparent, movements slow and laboured, stumbling pace, mild confusion, may appear alert. Use sobriety test, if unable to walk a 9 meter (30 foot) straight line, the person is hypothermic.
	33.9-32.2ºC	Violent shivering persists, difficulty speaking, sluggish thinking, amnesia starts to appear, gross muscle movements sluggish, unable to use hands, stumbles frequently, difficulty speaking, signs of depression, withdrawn.
Severe Hypothermia	32.2-30ºC	Shivering stops, exposed skin blue of puffy, muscle coordination very poor, inability to walk, confusion, incoherent/irrational behaviour, but may be able to maintain posture and appearance of awareness
	30-27.8ºC	Muscle rigidity, semiconscious, stupor, loss of awareness of others, pulse and respiration rate decrease, possible heart fibrillation.
	27.8-25.6ºC	Unconscious, a heart beat and respiration erratic, a pulse may not be obvious.
	25.6-23.9ºC	Pulmonary edema, cardiac and respiratory failure, death. Death may occur before this temperature is reached.

Hypothermia is a medical emergency – seek medical help immediately.

Are there regulated exposure limits for working in cold environments?

Canadian regulations do not provide maximum exposure limits for cold working environments. The Saskatchewan Ministry of Labour Relations & Workplace Safety developed work warm-up guidelines for cold conditions, which have since been adopted by the American Conference of Governmental Industrial Hygienists (ACGIH) as Threshold Limit Values (TLVs) for cold stress.

TLVs Work/Warm-up Schedule for a 4-Hour Shift

Air Temperature Sunny Sky		No Noticeable Wind		5 MPH Wind		10 MPH Wind		15 MPH Wind		20 MPH Wind	
°C (approx.)	°F (approx.)	Max. Work Period	No. of Breaks	Max. Work Period	No. of Breaks	Max. Work Period	No. of Breaks	Max. Work Period	No. of Breaks	Max. Work Period	No. of Breaks
-26° to -28°	-15° to -19°	(Norm. Breaks)	1	(Norm. Breaks)	1	75 min	2	55 min	3	40 min	4
-29° to -31°	-20° to -24°	(Norm. Breaks)	1	75 min	2	55 min	3	40 min	4	30 min	5
-32° to -34°	-25° to -29°	75 min	2	55 min	3	40 min	4	30 min	5	Non-emergency work should cease	
-35° to -37°	-30° to -34°	55 min	3	40 min	4	30 min	5	Non-emergency work should cease			
-38° to -39°	-35° to -39°	40 min	4	30 min	5	Non-emergency work should cease					
-40° to -42°	-40° to -44°	30 min	5	Non-emergency work should cease							
-43° & below	-45° & below	Non-emergency work should cease									

Taken from ACGIH 2002 TLVs and BEIs p. 164

**Source for table (& table on Page 1): Canadian Centre for Occupational Health & Safety (CCOHS) [Adapted from Threshold Limit Values (TLV) and Biological Exposure Indices (BEI) booklet: published by ACGIH, Cincinnati, Ohio, 2008.]*

First Aid treatment

For frostbite and immersion or trench foot the injured person should seek medical attention. The victim should be moved to a warm area if possible and have any tight clothing or jewellery loosened as to encourage blood circulation.

Cover the affected areas with sterile dressing and place gauze between the victim's fingers and toes to absorb moisture and prevent them from sticking together. Quickly transport the victim to emergency care.

Without proper care the affected areas, when warmed, can refreeze and cause more damage.

- **DO NOT** attempt to re-warm the affected area(s) but **DO** try to make sure the victim does not get any colder.
- **DO NOT** rub affected areas or apply dry heat.
- **DO NOT** allow the victim to drink alcohol or smoke.

Protecting your health & safety in cold temps

When workers are required to be in temperatures below freezing for extended periods of time, there should be heated warming shelters (tents, cabins, rest rooms) so that workers can take a break and warm up.

All work should be paced so workers do not sweat excessively. If strenuous work is required, those workers should have proper rest periods in a warm space where they can change into dry clothes.

Employees beginning a shift should receive proper time to acclimatize to the cold temperature before taking on a full work load.

Extreme cold temperatures can increase the likelihood of injury and the severity of those injuries.

Employers can help avoid these injuries through proper equipment design, proper clothing and ensuring good safe work practices including the proper training of all employees.