

WORK IN EXTREME WEATHER

Guidelines for Employees

This document will assist employees in understanding the health risks associated with working in the cold and establish reasonable solutions for staff to apply when working in cold weather. This document applies to all Pembina Trails employees who work in low temperatures, wind and or moisture.

To ensure the greatest possible protection for employees in the workplace, the cooperative efforts of management, supervisors and employees will help in establishing and maintaining a safe and healthful work environment.

Note: In general, outdoor play/classes are suspended for students when the wind chill temperature reaches -27°C (Pembina Trails Guideline on Cold Weather/Wind Chill/Snow Storm/Bus/School Cancellation) as forecast by Environment Canada. There may be exceptional circumstances where the nature, location, and grade level of an activity allows it to continue, perhaps with planning adaptations. Please see Field Trip Policies for details.

With the restrictions around educational outdoor settings in mind, there are segments of this document not relevant to employees working with students.

WORKING IN THE COLD

Cold can be an occupational hazard for many workers. All Pembina Trails employees should refer to this procedure to help identify signs and symptoms of cold injuries and how to protect themselves from winter elements.

This guideline will help you to:

- Understand how your body reacts in cold environments
- Recognize when it is too cold to remain outdoors
- Know the health risks associated with working in these temperatures
- Know what steps to take to control the hazards of exposure

The Body's Response to Cold & Heat:

When you work in extreme temperatures, your body has to adapt. To maintain a constant inner body temperature, the body must continually keep or gain heat in cold environments and lose heat in hot environments. To stay warm in cold environments, the body

- Shivers moving muscles help increase heat production, and
- Reduces blood flow to the skin and extremities (hands and feet) to reduce heat loss from the surface.

To stay cool in hot environments, the body

- Sweats evaporating sweat cools the body, and
- Increases blood flow to the skin to speed up the loss of heat from the skin (radiate away the excess heat) if the outside air is cooler.

By sweating, shivering, and changing the rate of blood flow, the body can adapt to a fairly wide range of temperatures.

In most of Canada, wind chill is included in the forecast when it reaches –25, as this is the point where frostbite becomes a risk. A wind chill warning is issued by Environment Canada when conditions become hazardous. Why does wind chill matter? On a calm day, your body is insulated because it warms up a thin layer of air very close to your skin (called the "boundary layer"). Wind removes this protective layer. Warming up a new boundary layer takes energy. As the wind blows away each new boundary layer, you feel colder. The wind also contributes to evaporation of moisture from your skin or from damp clothing against the skin, which makes you feel colder by drawing more heat away from the body. In addition, wet skin loses heat much faster than dry skin (a fact that helps you stay cool in the summer, but also makes you colder in the winter).

COLD RELATED INJURIES:

How hot or cold you feel depends on air temperature, radiant heat, relative humidity, air movement, physical exertion and clothing. How fast a person's body cools in cold weather depends on:

- Air temperature
- Wind speed (wind chill)
- Radiant Heat (sun)
- Moisture (perspiration)
- Exposure (work/rest schedule)
- Degree of acclimatization (previous exposure to the cold)
- Activity/type of work performed while outside
- Age and physical condition of the worker
- Clothing worn

The fingers and toes usually feel cold first. Shivering then sets in and is the body's way of warning that it needs to be warmed up. If not warmed, a person may become distracted by the discomfort which increases the chances of a cold injury.

Frostnip:

Frostnip is the mildest form of a freezing cold injury. It occurs when ear lobes, noses, cheeks, fingers or toes are exposed to the cold and the top layers of the skin freeze. The skin appears yellowish or white, but feels soft to the touch. The top layer of skin sometimes peels off the affected area. It may also cause painful tingling or burning sensation.

What to do:

Prevent frostnip by covering exposed skin surfaces.

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- Do not rub or massage the area, ice crystals in the tissue could cause damage when rubbed.
- Warm the area gradually use body heat (a warm hand) or warm water. Avoid direct heat which can burn the skin.
- Once the affected area is warm, do not re-expose it to the cold.

Frostbite:

Frostbite is caused by exposure to extreme cold or by contact with extremely cold objects (metal). Frostbite occurs when the skin and underlying tissue (fat, muscle, bone) are frozen. Any exposed skin is subject to frostbite when tissue temperature fall below freezing or when blood flow is obstructed under cold conditions. In mild cases, the symptoms include inflammation (redness and swelling) of the skin in patches accompanied by slight pain. Skin may appear white and waxy and be firm or hard to the touch. In severe cases, tissue damage without pain, or burning or prickling sensations and blistering can happen. Frostbitten skin is highly susceptible to infection, and gangrene (local death of soft tissues due to loss of blood supply) may develop.

If you notice signs of frostbite on yourself or someone else, seek medical attention.

- Move the person to a warm room as soon as possible.
- Unless absolutely necessary, do not walk on feet or toes that show signs of frostbite this can increase the damage.
- Gently loosen or remove clothing or jewelry that may restrict blood circulation.
- Do not rub or massage the frostbitten area this can increase the damage.
- Do not warm the area until you can ensure it will stay warm. If skin is rewarmed and then freezes again, severe tissue damage can result.
- Warm the area gradually Put the areas affected by frostbite in warm water not hot water (the temperature should be comfortable to touch for unaffected parts of the body)
- If warm water is not available, warm the affected area using body heat. For example, you can use the heat of an armpit to warm frostbitten fingers.
- Do not use a heating pad, heat lamp, or the heat of stove, fireplace or radiator for warming as affected areas are numb and can burn easily.
- Do not substitute these steps for proper medical care.

Hypothermia:

Hypothermia occurs when the body is unable to compensate for its heat loss and the body's core temperature starts to fall. The core body temperature drops below a level that allows it to maintain normal metabolic function, often only one or two degrees. Initial symptoms include a sensation of cold, followed by pain in exposed parts of the body. As exposure time increases and the body's core temperature continues to drop, the sensation of cold and pain is reduced and overall numbness develops. Additional symptoms may include muscle weakness, confusion, slurred speech and drowsiness. Hypothermia can progress rapidly and should be addressed immediately.

If you notice any signs of hypothermia, take the person's temperature. If it is below 95 F (35 C), get help immediately. If medical help is not immediately available, try to warm the person up.

- Move the person to a warm room as soon as possible.
- Remove any wet clothing the person is wearing.
- Warm the centre of the person's body chest, neck, head and groin using an electric blanket, if available. You can also use skin-to-skin contact under loose, dry layers of blankets, clothing, towels or sheets.
- Give warm, sweet drinks which can help increase body temperature.
- After body temperature has increased, keep the person dry and wrap their body, including their head and neck, in a warm blanket.
- Get the person proper medical attention as soon as possible.

CLOTHING RECOMMENDATIONS

Some collective agreements include provisions for outdoor clothing, generally when the nature of the work requires that it continue regardless of the elements (example – snow clearing on school pathways in order to ensure safe entry). This section of the document is educational for all employees, to enhance knowledge about safe clothing choice.

Cold weather combined with wind chill can speed up the rate at which your body loses heat. How much heat you lose depends not only on the temperature and wind chill but also on what you wear. Wearing warm clothing in several thin layers, rather than one heavy layer, helps to trap insulating air, creating a thicker boundary layer around the body, which keeps in heat. It also helps to prevent overheating and sweating because you can remove layers of clothing as needed. Sweating should be avoided to minimize the body's heat loss. Successive outer layers should be larger than the inner layer, otherwise the outermost layer will compress the inner layers and will decrease the insulation properties of the clothing.

For the Body:

- Dress in layers (at least three). The inner layer: should be light-weight synthetic (polyester or polypropylene). This layer provides insulation and should be able to "wick" moisture away from the skin to help keep it dry.
- Inner layers provide insulation for the weather conditions under which the work is being done. They should also be easy to open or remove. Cotton is not recommended. It tends to get damp or wet quickly, and loses its insulating properties. Wool, fleece and synthetic fibres, on the other hand, do retain heat when wet and are recommended.
- The middle layer should be wool, quilted fibres, or fleece which create an insulating layer.
- Outer layers should be loose fitting and rain, snow and wind repellent/resistant with
 provisions for ventilation. These layers should have a means for closing off an opening
 at the waist, neck and wrists to help control how much heat is retained or vented off.
 This helps to prevent you from getting too warm and prevents excessive sweating.
 Outer layers should also be filled with down or insulating fibre with an attached hood.
- Keep your head covered (up to 40-50% of your body heat can be lost when the head is exposed). Wear a winter toque/hat suitable for the conditions, including a wind resistant/thinsulate layer and large enough to cover the ears and keep them warm.
- Insulated gloves or mittens suitable for the conditions. Hand wear should be loose fitting and made of wood or synthetic fabric liners. 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, insulated mittens should be used. Gloves inside mittens plus windproof over mitts also work for extremely cold conditions.

- Wear a face covering to keep your face warm, such as a scarf, neck tube or face mask (balaclava) when working in very cold conditions.
- Be cautious about wearing gloves or scarves that can get caught in moving parts of machinery.
- Wear long underwear made of wool, silk or synthetic fabric. Pants should be made of wool or synthetic fabric.
- Clothing must be dry. While a worker is resting in a heated area, perspiration should be allowed to escape by opening the neck, sleeves or removing several layers including the outer layer.
- When it is very cold, or when the wind chill is significant, cover as much exposed skin as
 possible. Your body's extremities, such as the ears, nose, fingers and toes, lose heat the
 fastest.

For the Feet:

- Wear footwear that protects against cold and dampness. Footwear should be insulated
 and fit comfortable when socks are layered. Boots that are felt-lined, rubber-bottomed
 and waterproof with removable insoles and socks are preferred as they can be taken
 apart to dry more easily or new linings can be used.
- Socks made of polypropylene will help keep feet dry and warmer by wicking sweat away
 from skin. If two pairs of socks are worn, the outer sock should be a larger size so that
 the inner sock is not compressed.
- Always wear the right thickness of socks for your boots. If they are too thick, the boots
 will be tight and the socks will lose much of their insulating properties. The foot will also
 be squeezed which would slow the blood flow to the feet and increase the risk for cold
 injuries.

To prevent excessive sweating, remove clothing in the following order:

- Start by opening your jacket
- Next, remove one or more layers of clothing
- Then remove headgear and scarf
- Finally, remove mittens or gloves (unless you need protection from snow or ice).

CONTROLLING EXPOSURE:

This section is not intended for employees working with students, as the conditions described would not occur when following the Pembina Trails Guideline on Cold Weather/Wind Chill/Snow Storm/Bus/School Cancellation.

For employees in trades, custodial groups and others not working with students, the best way to control a hazard is to eliminate it. Naturally, this step is practically impossible when the hazard is an outdoor environmental condition. The measures for control, therefore, should focus on engineering and administrative controls, and only if necessary, personal protective equipment.

Note: personal protective equipment would only be applied in extreme weather conditions and only as a last resort.

- 1. Reduce exposure by applying engineering controls such as:
 - Provide a heated shelter for workers for a work/warm-up breaks.
 - Shield work areas from drafts or winds as much as possible.
 - Use thermal insulating material on equipment (such as when touching metal handles, or when you have to sit or kneel on concrete).
 - Protect the hands, face, and feet from frostbite with an on-site source of heat. For example, contact warm plates may be used on equipment handles or steering wheels.
- 2. Apply administrative controls to reduce exposure;
 - Use a work/warm-up schedule. A warm shelter/building or vehicle should be available so workers can warm up.
 - Allow a period of adjustment to the cold before assigning a full work schedule (8 hr.).
 - Allow individuals to set their own pace and take work/warm up breaks when needed.
 - Educate new or newly transferred workers on the hazards of working in a cold environment.
 - Avoid activities, whenever possible, that lead to heavy sweating.
 - Do as many tasks as possible indoors and minimize the length of time people must work outdoors.
 - Work outside during the warmer hours of the day (mid-day/early afternoon).
 - Minimize activities that reduce blood circulation, such as sitting or standing for long periods of time. Keep active.
 - Use a buddy system and avoid working alone in very cold weather. If you see symptoms in a co-worker, take appropriate preventive steps.
 - Do not sit or kneel on cold, unprotected surfaces.
 - Older workers, or those with certain medical problems, need to be extra alert about the effects of cold stress. Check with a doctor about special needs and precautions.
 - Avoid using alcohol or drugs that may impair judgment while working in a cold environment. Hypothermia commonly occurs in association with alcohol abuse. In addition to its effects on judgment, alcohol increases heat loss by dilating the blood vessels and it may prevent a person from shivering (a warming mechanism).
 - Keep energy levels up and prevent dehydration by consuming warm, sweet, caffeinefree, non-alcoholic drinks and soup.
- 3. Use a combination of engineering controls, administrative controls and personal protective personal equipment when there is a greater risk to worker safety due to extreme weather conditions.

RESPONSIBILITIES:

Supervisors:

- be familiar with all jobs under their supervision which have been identified to have potential risk of cold stress
- ensure information has been provided to workers whose work places them at risk of cold stress
- monitor environmental conditions (i.e. temperature and wind velocity and/or wind chill), as appropriate, on cold days and on days where brisk wind and cold air temperature combine to reach levels considered hazardous
- advise workers to:

- o wear multiple layers of light, loose fitting clothing
- o pay special attention to protecting feet, hands, face & head
- report to their supervisor cold stress-related symptoms in themselves or their coworkers
- adhere to the recommended work-warm-up schedule, established to prevent frostbite or hypothermia

Workers:

- be familiar with cold stress hazards, predisposing factors and preventative measures
- follow procedures established to prevent cold-stress related injuries
- report to their supervisor any cold stress-related symptoms in themselves or their coworkers
- follow the work/rest breaks schedule, as advised by supervisors, to prevent frostbite or hypothermia
- understand and be able to recognize frostbite and hypothermia

WORK WARM-UP SCHEDULE:

The work warm-up schedule shows the warm-up breaks required for working in cold weather conditions and the normal breaks to be provided to workers, every two hours. The schedule allows additional breaks for workers as the wind velocity at the work site increases and/or the temperature drops. The schedule applies to moderate/heavy work in cold temperatures.

Warm-up breaks are assumed to be provided, for ten minutes, in a warm environment. The schedule assumes that "normal breaks" are taken once every two hours. At the end of a 4-hour period, an extended break (e.g. Lunch break) in a warm location is recommended.

Upon returning indoors, workers can remove the outer layer of clothing and loosen the remainder of the clothing to allow for sweat evaporation. Sweat dampened clothes lose their insulation value. Prior to redressing, to go back outside, workers should ensure they have regulated their body temperature, but haven't gotten cold while sitting inside.

Mandatory work/warm-up breaks begin when the temperature reaches -27 C, with winds of 16 km/h or greater. All non-emergency work should stop by the time the temperature reaches -43 C (-45 F), if there is no noticeable wind. If there is wind, use the chart below to determine when to stop work.

Note: Apply the schedule one step lower for work with limited physical activity. For example, at -35 C (-30 F), with no noticeable wind, a worker with a job requiring little physical movement should have a maximum work period of 40 minutes with four breaks in a four hour period.

REGULATORY REQUIREMENTS & OTHER REFERENCES:

- 1. WS&H Act W210, Section 4, 5, 7, 7.1 Mb. Regulations 217/2006, Part 4, Section 4.12 Thermal Stress
- 2. Pembina Trails Guideline on Cold Weather/Wind Chill/Snow Storm/Bus/School Cancellation
 - https://www.pembinatrails.ca/Pages/Cold-Weather.aspx
- 3. Guideline for Thermal Stress
 - https://www.safemanitoba.com/Page%20Related%20Documents/resources/thermal_stress_quide_2007.pdf
- 4. CCOHS Cold Environments, Working in the cold https://www.ccohs.ca/oshanswers/phys_agents/cold_working.html
- 5. Environment Canada Wind Chill Index https://www.canada.ca/en/environment-climate-change/services/weather-health/wind-chill-cold-weather/wind-chill-index.html
- 6. Safe Work Saskatchewan Working in Cold Conditions
 http://www.worksafesask.ca/wp-content/uploads/2019/03/Working-in-Cold-Conditions-Fact-Sheet_v4.pdf
- 7. ACGIH TLV Guideline

For information – typically only the top quadrant refers to students and teachers

Source: Environment Canada.

Wind chill	Exposure Risk	# of 10min. breaks	Health concerns	What to do
0 to -9	Low risk	Not required, normal work hours	Slight increase in discomfort	Dress warmly Stay dry
-10 to -25	Moderate risk	 Not required, normal work hours However, workers experiencing the onset of heavy shivering, frostnip, frostbite, excessive fatigue, irritability, drowsiness or euphoria should take a warm up break in a heated shelter. Note: mandatory work/warm up breaks are not required until -26°C For teachers/students – outdoor recess/classes are cancelled at -27°C 	Uncomfortable Increased risk of hypothermia and frostbite if outside for long periods of time without adequate protection	Dress in layers of warm clothing, with an outer layer that is wind/rain/ snow resistant. Wear a hat, mittens or insulated gloves, a scarf and insulated, waterproof footwear. Stay dry. Keep active (continuous body movement).
-26 to -39	High Risk: exposed skin can freeze in 10-30 minutes	Semmy bky/ke Re noticeable wind Wind 8 km/h Wind 318km/h Wind 32 km/h	High risk of frostnip, frostbite: check face and extremities for numbness or whiteness. High risk of hypothermia if outside for long periods without adequate clothing or shelter from wind and cold.	Dress in layers of warm clothing, with an outer layer that is wind/rain/ snow resistant. Cover exposed skin. Wear a hat, mittens or insulated gloves, a scarf, neck tube or facemask and insulated, waterproof footwear. Stay dry. Keep active (continuous body movement).
-40 to -47	Very high risk: exposed skin can freeze in 5 to 10 minutes (in sustained winds over 50 km/h, frostbite can occur faster than indicated.)	Summy sky/ke No noticeable wind Wind 25 km/h Wind 25 km/h Wind 35 km/h Wind 32 km/h	Very high risk of frostbite: Check face and extremities for numbness or whiteness. Very high risk of hypothermia if outside for long periods without adequate clothing or shelter from wind and cold.	Dress in layers of warm clothing, with an outer layer that is wind/rain/ snow resistant. Cover all exposed skin. Wear a hat, mittens or insulated gloves, a scarf, neck tube or facemask and insulated, waterproof footwear. Stay dry. Keep active (continuous body movement).
-48 to -54	Severe risk: exposed skin can freeze in 2 to 5 minutes (In sustained winds over 50 km/h, frostbite km/h, frostbite faster than indicated.)	Summy kily fair No nociceable wind Wind 18 km/h Wind 18 km/h Wind 18 km/h Wind 28 km/h Wind 38 k	Severe risk of frostbite: Check face and extremities frequently for numbness or whiteness. Severe risk of hypothermia if outside for long periods without adequate clothing or shelter from wind and cold.	Be careful! Dress warmly in layers of clothing, with an outer layer that is wind/rain/ snow resistant. Cover all exposed skin. Wear a hat, mittens or insulated gloves, a scarf, neck tube or facemask and insulated, waterproof footwear. Be ready to cut short or cancel outdoor activities. Stay dry. Keep active (continuous body movement).
-55 and colder	Extreme risk: exposed skin can freeze in less than 2 minutes	Summy sky/ab No neciceable wind Non-encoperory sort Sum/h Wind 18 km/h Wind 18 km/h Wind 18 km/h Wind 28 km/h	DANGER! Outdoor conditions are hazardous.	Stay indoors.