HEALTH & SAFETY OPERATIONAL GUIDELINE			
Title:	COLD STRESS		
Section:	SAFE WORK RULES	**Number:**	05-005
Subsection:	General Health & Safety	**Effective Date:**	**January 1, 2008**

GENERAL

In cold weather, the hazards associated with working outdoors require special attention. Your body tries to maintain an internal (core) temperature of 37°C. Exposure to *lower temperatures*, *wind* and *moisture* can result in serious cold related illnesses and injuries of proper safety measures are not implemented.

HAZARDS

Frostbite: Severe reaction to cold exposure that causes freezing in the deep layers of skin and tissue. Frostbite can cause permanent damage. It is recognizable by a loss of feeling and a waxy-white or pale appearance in fingers, toes, nose, or ear lobes.

Hypothermia: Prolonged exposure to the cold causes the body to lose energy faster than it is produced, dropping body temperature. Hypothermia occurs when the body temperature drops to less than 35°C. Symptoms of hypothermia include:

- uncontrollable shivering
- slow speech, memory lapses
- frequent stumbling, poor coordination, drowsiness, and exhaustion

Overexertion:

Heavy work requires more effort to when wearing bulky clothing and winter boots especially when walking through snow. This causes the body to use energy faster. 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.

Cold workers are more prone to injury because the temperature impacts their performance of complex mental tasks and reduces the sensitivity and dexterity of their fingers.

Slips and Falls: Cold weather often exposes workers to ice and snow underfoot.

CONTRIBUTING FACTORS

Exposure Uninterrupted exposure to colder temperatures increases the risk of cold weather illness and injuries.

Humidity: Moisture in the air and sweat conduct heat away from the body 25 times faster than dry air.

Ice/snow: The presence of ice and snow can complicate driving, walking and visibility hazards.

Temperature: Protective cold weather clothing should be worn at or below 4°C

Water/moisture: Some work is performed in the presence of water, slush that requires special attention during cold weather.

Wind chill: At any temperature, you feel colder as the wind speed increases. Wind chill is an estimate of how cold it would feel on exposed skin when air temperature and wind speed are combined. It can be used as a general guideline for deciding clothing requirements and the possible health effects of cold. See Table One.

Wind speed: Air movement (wind) is usually measured in km/h. The following is a suggested guide for estimating wind speed if accurate information is not available:

- 8 km/h: light flag moves
- 16 km/h: light flag fully extended
- 24 km/h: raises newspaper sheet
- 32 km/h: causes blowing and drifting snow
- 40 km/h: small trees sway; large flags extend and snap
- 50 km/h: larger tree branches move; power lines whistle
- 60 km/h: whole trees move; resistance walking against wind

Wind also moves heat away from the body.

HAZARD CONTROLS

Substitution/Contact

- Metal handles and bars should be covered by thermal insulating material or replaced with non-metallic material if possible
- Machines and tools should be designed so that they can be operated without having to remove mittens or gloves

Engineering

- Heated warming shelters such as tents, cabins or rest rooms should be available
- If the rest area is warm enough it is preferable to take off the outer layer(s) so that the perspiration can evaporate from the clothing.

Administrative

- Proper rest periods in a warm area should be allowed and employees should change into dry clothes. See Table Two.
- New employees should be given enough time to get acclimatized to cold and protective clothing before assuming a full work load
- Procedures for providing first aid and obtaining medical care should be clearly outlined. See Table Three.

- While working in cold, a buddy system should be used. Look out for one another and be alert for the symptoms of hypothermia.
- To prevent excessive sweating while working, remove clothing in the following order:
  - mittens or gloves (unless you need protection from snow or ice)
  - headgear and scarf
  - then open the jacket at the waist and wrists, and
  - remove layers of clothing

As you cool down, follow the reverse order of the above steps.

For snow shoveling;

- Try a shovel with a smaller blade, so there will be less to lift and less strain on your back.
- Stand with your feet at the same width as your hips, keep the shovel close to your body, and lift with your knees instead of your back.
- Don't twist around to toss the snow -- turn your entire body to prevent back injury.

Personal Protective Equipment

Clothing

- Clothing should be worn in multiple layers; air between layers of clothing provides better insulation than the clothing itself.

- Layers also gives you the option to open or remove a layer before you get too warm and start sweating or to add a layer when you take a break. It also allows you to accommodate changing temperatures and weather conditions.
- Outer jackets should have the means for closing off and opening the waist, neck and wrists to help control how much heat is retained or given off.
- 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.
- The inner layer should provide insulation and be able to "wick" moisture away from the skin to help keep it dry.
- Under extremely cold conditions, heated protective clothing should be made available if the work cannot be done on a warmer day.

Face and Eye Protection

- 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 eye wear for protection against ultraviolet light from the sun, glare from the snow, blowing snow/ice crystals, and high winds at cold temperatures.

Hand protection

- 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.
- Avoiding skin contact when handling evaporative liquids (gasoline, alcohol, cleaning fluids) below 4°C.

Head protection

- 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.

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.

- If work involves standing in water or slush, waterproof boots must be worn. While these protect the feet from getting wet, they also prevent the perspiration to escape. The insulating materials and socks will become wet more quickly and increase the risk for frostbite.
- 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 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.
- 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 when they are compressed inside the boot.

Things you can do personally

- Eat properly and frequently. Working in the cold requires more energy than in warm weather because the body is working to keep the body warm.
- Drink fluids often especially when doing strenuous work. For warming purposes, hot non-alcoholic beverages or soup are suggested. Caffeinated drinks such as coffee should be limited because it increases urine production and contributes to dehydration. Caffeine also increases the blood flow at the skin surface that can increase the loss of body heat.
- Alcohol should not be consumed as it causes expansion of blood vessels in the skin (cutaneous vasodilation) and impairs the body's ability to regulate temperature (it affects shivering that can increase your body temperature)
- Properly warmed-up muscles are less likely to be strained or injured, so stretch or walk around for a few minutes before you start.
- When walking on an icy or snow-covered walkway, take short steps and walk at a slower pace so you can react quickly to a change in traction.
- If you must walk in the street, walk *against* the traffic and as close to the curb as you can.
- Be on the lookout for vehicles that may have lost traction and are slipping towards you. Be aware that approaching vehicles may not be able to stop at crosswalks or traffic signals.

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SUMMARY

- Recognize the environmental and workplace conditions that lead to potential cold-induced illnesses and injuries
- Learn the signs and symptoms of cold-induced illnesses/injuries and what to do to help those who are affected
- Select proper clothing for cold, wet, and windy conditions
- Layer clothing to adjust to changing environmental temperatures. Wear a hat and gloves, in addition to underwear that will keep water away from the skin (polypropylene).
- Take frequent short breaks in warm dry shelters to allow the body to warm up
- Perform work during the warmest part of the day
- Avoid exhaustion or fatigue because energy is needed to keep muscles warm
- Use the buddy system (work in pairs)
- Drink warm, sweet beverages (sugar water, sports-type drinks). Avoid drinks with caffeine (coffee, tea, or hot chocolate) or alcohol.
- Eat warm, high-calorie foods like hot pasta dishes

Table One

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**

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

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

Table Two

THRESHOLD LIMIT VALUES WORK/WARM-UP SCHEDULE FOR FOUR-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		
-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 ↓		Non-emergency work should cease ↓					
-43° to below	-45° & below	Non-emergency work should cease									

Table Three

	What happens to the body? (Signs and Symptoms)	What should be done? (Treatment)
Frost Bite	Freezing in the deep layers of skin and tissue. Warning signs include: -pale, waxy skin colour -skin feels unusually hard and numb (a loss of feeling). Note: at the first signs of redness or pain get out of the cold or protect any exposed skin as frostbite may be beginning.	Move the person to a warm dry area. Remove any wet or tight clothing that may cut off blood flow to the affected area. Keep the area warm with body heat (i.e. place affected hand between upper arm and body). Look for other signs of hypothermia. Seek medical attention as soon as possible. **DO NOT** rub the affected area as it can damage the skin and tissue. **DO NOT** attempt to thaw the affected area on site if there is a risk of re-freezing as this will cause more damage.
Hypothermia	Normal body temperature (37°C) drops to or below 35°C. Warning signs include: -fatigue or drowsiness, -uncontrolled shivering, -cool bluish skin, -slurred speech, -clumsy movements, -irritable, irrational or confused behaviour -constricted pupils. -unconsciousness	Call for emergency help (911) immediately. Move the person to a warm dry area. Remove any wet clothing and wrap the person in blankets or clothing. Have them drink warm sweet drinks if they are alert. **DO NOT** provide fluids containing caffeine or alcohol. Keep them awake. Seek immediate medical attention.

THIS GUIDELINE TAKES EFFECT IMMEDIATELY AND REMAINS IN EFFECT UNTIL REPLACED BY A NEW GUIDELINE OR SUPERSEDED BY LEGISLATION/REGULATION

ORIGINAL SIGNED

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Employer Co-Chair, JHSC Worker Co-Chair, JHSC