



Cold Weather Protocol



The purpose of this protocol is to serve as a guide for Search Managers to assist in making their decisions when encountering extreme cold weather during a search. The Search Manager should assess the situation using all available information and respond accordingly. The following is only meant as a guide as the information contained has been gathered from personal experiences and documented sources. The Search Manager must make their own decision.

Cold weather has been broken down to three categories as follows:

Intense: -30°C or -20°F

Severe -35°C or -30°F

Extreme -40°C or -40°F

Intense Cold to Severe

Intense cold in Northern Saskatchewan in the sheltered bush is easier to work in than in the wind swept open areas and lakes. Please refer to the wind chill tables in the **Appendix**.

Remember at no time must a searchers safety be jeopardized. Searches can be safely carried out if all involved work safely and do not attempt any heroics.

Typical activities during intense cold.

Most vehicles, cars, trucks, vans, aircraft operate quite well if properly winterized. Most vehicles have to be plugged in, in order to start.

Gasoline engines may require methol hydrate to deal with frozen gas lines.

Handle refueling from jerry cans with caution, be aware of static electricity and sparks. Do not use a siphon hose, you will freeze your mouth.

Some plastics become brittle and may crack. GPS's, radios with Liquid Crystal displays may be damaged if allowed to freeze.

Vehicles need to be run for a period to warm up and should be run at least 10 minutes every hour to keep warm.

Outdoor activities can take place with normal winter precautions. Cross country Skiing, Snow shoeing, walking, working with chainsaws, air and ground searching. Skidooing conditions are good if properly dressed and equipped.

Do not touch metal with bare hands
Good winter boots are required, ski pants or coveralls usually worn along with winter underwear.

Layering of clothing a must as activities will cause sweating if overdressed, remove and add layers as required.

The risk of frost bite is low if conditions are not windy, however the risk is still there.

Searching at these temperatures may be limited to vehicle use, skidoos, limited walking, skiing, snow shoeing, and aircraft. A rescue plan should be in place if searchers encounter trouble.

A 45 minute warm up period required every 2 hours in no wind conditions
20 minute warm up period recommended every hour with a 24 km/h or more wind. (15 mph wind) *

Severe Cold to Extreme

Typical activities during severe cold.

Vehicles may be harder to start even when plugged in, need to be run for a longer period to warm up, poor antifreeze may freeze or congeal and cause overheating, a card should be installed in front of radiators especially vehicles operated at highway speeds.

Gasoline engines may require methyl hydrate to deal with frozen gas lines.

Handle refueling from jerry cans with caution; be aware of static electricity and sparks. Do not use a siphon hose, you will freeze your mouth.

Plastics and some metals may crack and break.

Aircraft may not operate at these temperatures at pilots/companies discretion.

Limited outdoor activities may take place. There is a risk of freezing ones lungs if breathing too rapidly. Do not run, only walk, you must not sweat at these temperatures.

Ice fog and fog from open water can restrict visibility.

One must be properly dressed, good skidoo boots, skidoo suit, coveralls and parka with a fur lined hood.

The risk of frost bite is high even if conditions are not windy, check yourself often.

Packed snow will "squeak" as you walk on it. Do not touch metal with bare hands.

Searching at these temperatures may be limited to vehicle use, skidoos, use of aircraft doubtful.

Only very experienced and equipped searchers should go.

Direct communications are necessary as well as a rescue plan in case they get in trouble.

Vehicles and skidoos should travel in units of 2 or 3, never alone.

A 20 minute warm up period required every 1 hour no wind conditions *

Extreme Cold

Typical activities during extreme cold.

At -40° and lower everything changes. Plastics will shatter and metal will break. The blade of an axe head can chip if struck on a log or tree.

Trees will split with loud crack sounding like a shot gun.

Propane bottles will not have enough pressure to work, butane lighters will not work. Lighting a fire becomes a challenge. If you try to light a fire with a match, the steam from the match or lighters will frost up the kindling so bad it will not light. You need enough heat to evaporate the frost. Ordinary fire starters you buy will not light.

Kerosene (coal oil) will congeal into a jello like mass, transmission oil becomes hard like chocolate. The plastic container can shatter if dropped and the oil retains the shape of the jug until warmed up, you can pick it up with your gloved hands.

Anything containing moisture may crack or split including some electronic components.

Do not drink alcohol that has been sitting outside, even though it may be liquid it is still -40° and will freeze your throat and stomach if swallowed. People have been hospitalized from drinking extreme cold liquids.

Even on a gas stove it takes a long time to boil water for tea. You can hold your hand two inches above the flame and hardly feel it.

For survival, if you get a fire going you must also bring the wood close to thaw it out before it will burn. Try to utilize a small fire between your legs instead of a large fire that you stand away from, that consumes a lot of wood.

Vehicles, cars, trucks, vans, can operate if properly winterized. Vehicles have to be plugged in, in order to start. Gasoline engines may require methyl hydrate to deal with frozen gas lines.

Be extremely cautious handle refueling from jerry cans; be aware of static electricity and sparks. Do not use a siphon hose, you will freeze your mouth. Fuel spilt on a person may soak through clothing and frost burn the skin.

Plastics become brittle and crack or shatter.

Vehicles need to be run for a long period to warm up.

Tires will have a "flat side" until driven a ways and sometimes will disintegrate after a few turns or may come off the rim.

Older vehicles may have a hard time keeping the windows defrosted.

Remember batteries only put out a fraction of their power when cold.

Be cautious when bringing in frozen equipment, radio's, guns, etc, they will frost up and if taken out again will have ice on them. This can be dangerous with a gun.

Outdoor activities should be suspended.

There is a risk of freezing one's lungs if breathing too rapidly. Do not run, only walk, you must not sweat at these temperatures and you must not stop moving for very long either. Breathe through your nose to warm incoming air.

Ice fog and fog from open water can restrict visibility.

One must be properly dressed, winter underwear, good skidoo boots, skidoo suit or coveralls and parka with a fur lined hood.

The risk of frost bite is high even if conditions are not windy, check yourself often

Packed snow will "squeak" as you walk on it.

Do not touch metal with bare hands.

Searching at these temperatures may be limited to vehicle use and perhaps skidoos, Only very experienced and equipped searchers used to cold weather should go out. Direct communications are necessary as well as a rescue plan in case searchers get into trouble. Vehicles and skidoos should travel in units of 2 or 3, never alone.

A 15 minute warm up period is required every 30 – 45 minutes *

The Search Manager should expect to have trouble and be prepared for it. Vehicle break down, gas lines and radiators freezing, tire trouble, battery trouble skidoo belts disintegrating, windshields shattering.

People getting frost bite, frozen feet and hands, radio batteries freezing,

Have a rescue plan in place and have units on standby to go. Limit exposure as much as possible.

Remember that in cold temperatures the body requires lots of calories (food)

Normal conditions a person requiring 1200 – 2000 calories will require 6000 or more just to maintain energy levels, prevent fatigue and keep warm. Searchers must take food with them if they are gone any length of time. A thermos or two with soup, juice or non caffeinated beverage for the searchers and the subject(s) is also recommended in addition to having water along.

The bottom line – if you have experienced people who know what they are doing as searchers; with well maintained winterized equipment, properly dressed, with direct communications, with a back up heat source, then you pretty much have the essentials covered. Evaluate the risk carefully as you will be sending the searchers into a hostile unforgiving environment.

APENDIX

Wind Chill Calculation Chart,

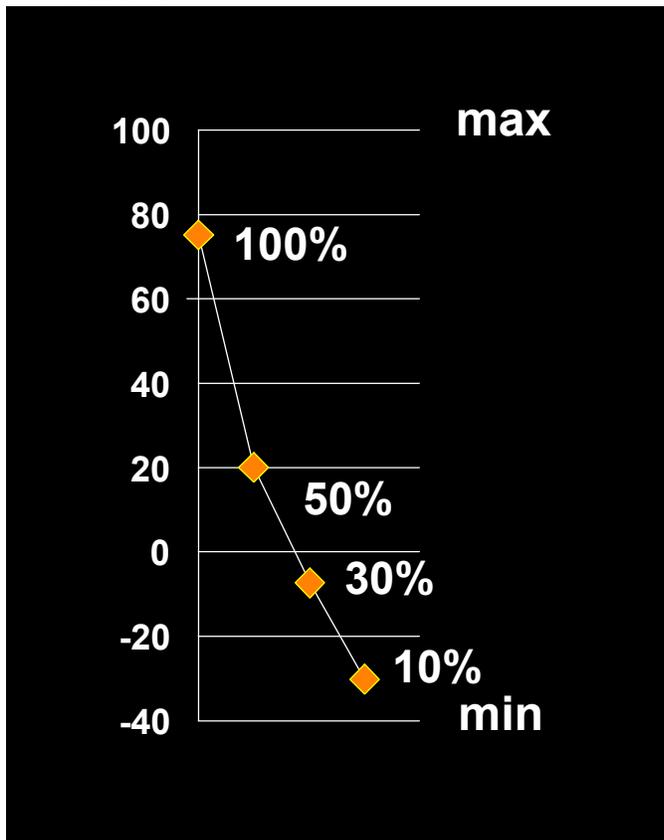
where T_{air} = Air temperature in °C and V_{10} = Observed wind speed at 10m elevation, in km/h.

T air	5	0	-5	-10	-15	-20	-25	-30	-35	-40	-45	-50
V₁₀												
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

Low risk of frostbite for most people
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

TEMP



EFFICIENCY

Temperature versus battery efficiency

At -40° the power available is near zero
A fully charged battery will not freeze,
however, it must be warmed to 35° F or 2° C
in order to receive a full charge.

* Warm up periods guide lines from Sask Labour.

Table 5 TLVs Work/Warm-up Schedule for Outside Workers based on a 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						
-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		Non-emergency work should cease			
-40° to -42°	-40° to -44°	30 min.	5	Non-emergency work should cease		Non-emergency work should cease		Non-emergency work should cease			
-43° & below	-45° & below	Non-emergency work should cease		Non-emergency work should cease		Non-emergency work should cease		Non-emergency work should cease		Non-emergency work should cease	

*2000 TLVs and BEIs - Threshold Limit Values for Chemical Substances and Physical

HYPOTHERMIA--*signs and symptoms*

When the body can no longer maintain core temperature by constricting blood vessels, it shivers to increase heat production. Maximum severe shivering develops when the body temperature has fallen to 35°C (95°F).

The most critical aspect of hypothermia is the body's failure to maintain its deep core temperature. Lower body temperatures present the following signs and symptoms:

- persistent shivering--usually starts when core temperature reaches 35°C (95°F)
- irrational or confused behavior
- reduced mental alertness
- poor coordination, with obvious effects on safety
- reduction in rational decision-making.

In addition, acute exertion in cold can constrict blood vessels in the heart. This is particularly important for older workers or workers with coronary disease, who may have an increased risk of heart attack.

HYPOTHERMIA--*stages*

Mild

Early signs of hypothermia include

- shivering
- blue lips and fingers
- poor coordination.

Moderate

The next stage includes

- mental impairment
- confusion
- poor decision-making
- disorientation
- inability to take precautions from the cold
- heart slowdown
- slow breathing.

Severe

In severe cases, hypothermia resembles death. Patients must be treated as though they are alive. Symptoms of severe hypothermia include

- unconsciousness
- heart slowdown to the point where pulse is irregular or difficult to find
- no shivering
- no detectable breathing.

HYPOTHERMIA--*first aid*

Stop further cooling of the body and provide heat to begin rewarming.

- Carefully remove casualty to shelter. Sudden movement or rough handling can upset heart rhythm.
- Keep casualty awake.
- Remove wet clothing and wrap casualty in warm covers.
- Rewarm neck, chest, abdomen, and groin--but not extremities.
- Apply direct body heat or use safe heating devices.
- Give warm, sweet drinks, but only if casualty is conscious.
- Monitor breathing. Administer artificial respiration if necessary.
- Call for medical help or transport casualty carefully to nearest medical facility.

Frostbite is a common injury.

FROSTBITE--*signs and symptoms*

Frostbite is a common injury caused by exposure to severe cold or by contact with extremely cold objects.

Frostbite occurs more readily from touching cold metal objects than from exposure to cold air. That's because heat is rapidly transferred from skin to metal.

The body parts most commonly affected by frostbite are face, ears, fingers, and toes. When tissue freezes, blood vessels are damaged. This reduces blood flow and may cause gangrene.

Frostbite symptoms vary, are not always painful, but often include a sharp, prickling sensation.

The first indication of frostbite is skin that looks waxy and feels numb. Once tissues become hard, the case is a severe medical emergency.

Severe frostbite results in blistering that usually takes about ten days to subside. Once damaged, tissues will always be more susceptible to frostbite in future.

FROSTBITE--*first aid*

- Warm frostbitten area gradually with body heat. ***Do not rub.***
- Don't thaw hands or feet unless medical aid is distant and there is no chance of refreezing. Parts are better thawed at a hospital.
- Apply sterile dressings to blisters to prevent breaking.
- Get medical attention.

RISK FACTORS

Various medical conditions can increase the risk of cold injury:

- heart disease
- asthma/bronchitis
- diabetes

Trench foot.

Trench foot is caused by long, continuous exposure to a wet, cold environment. Logging workers regularly experience such conditions also experienced by skidooper's who got wet feet from slush or anyone with sweaty feet from walking. Symptoms include a tingling or itching sensation, burning, pain, and swelling. Blisters can form in extreme cases. Move the victim to a warm, dry area. The affected tissue should be carefully washed and dried, rewarmmed, and slightly elevated. Seek medical assistance in extreme cases.