

March 21, 2022
Working on Ice Covers
PURPOSE/APPLICATION

This Safe Work Practice outlines work practices and procedures intended to increase the safety of those working or travelling on winter roads, ice surfaces and bodies of water greater than 1 meter depth. In the winter months from time-to-time Strike Group may be required to travel on or over an ice road or bridge or to work on an ice surface.

The requirements of this standard must be met whenever an employee or contractor is travelling on an ice road, bridge, or surface, or when working on an ice surface.

PPE

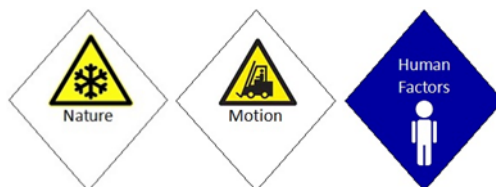
- Strike Minimum PPE
- Warm clothing, worn in layers
- UV filtering eye protection



TRAINING




- Strike and Site-Specific Requirements
- Review of this policy

HAZARDS & CONCERNS

- Failure of ice to support the weight
- Workers entering water
- Glare from snow and ice


TYPES OF ICE COMMONLY ENCOUNTERED

Type of Ice	Description	Characteristics
<p>Blue Ice – Freshwater Lake Ice</p> 	<ul style="list-style-type: none"> • Ice that grows below the layer of surface ice under calm conditions • It usually forms in vertical, columnar crystals that contain few air bubbles • It appears to be blue because it's clear enough to see the water underneath it 	<ul style="list-style-type: none"> • Uniform ice quality, higher strength due to low variability • Minimal thickness over an area • Higher strength due to uniform thickness and quality
<p>Blue Ice: Rivers</p> 	<ul style="list-style-type: none"> • Ice that grows below the layer of surface ice under variable conditions • It appears to be blue because it's clear enough to see the water underneath it 	<ul style="list-style-type: none"> • Medium to high variability over an area • Fairly uniform ice quality • More prone to losing underside ice thickness due to currents • Variable strength due to variable ice thickness

Type	Description	Characteristics
<p>White Ice - Natural flood or Overflow Ice</p> 	<ul style="list-style-type: none"> • Ice that forms on top of the surface ice by natural flooding of snow • Appears white because it contains a significant number of air bubbles 	<ul style="list-style-type: none"> • Ice thickness varies greatly • Higher potential for water and air pockets that reduce ice thickness
<p>White Ice - Constructed Flood Ice</p> 	<ul style="list-style-type: none"> • Ice that forms on top of the surface ice through flooding of snow • Appears white because it contains a significant number of air bubbles 	<ul style="list-style-type: none"> • Uniformity and quality depend on construction practices, • If ice is well built, then this ice, (once completely frozen and inspected), can be considered to have similar strength to freshwater lake ice
<p>Muskeg – Peatland</p> 	<ul style="list-style-type: none"> • Surface can change quickly from frozen peat to ice floating on peat • Ice cover requires special analysis 	<ul style="list-style-type: none"> • Strength is highly variable over the entire area due to water chemistry and temperature • Frost depth depends on air temperature, peat composition/ thickness and ground cover requires specialized analyses and investigation of ice conditions

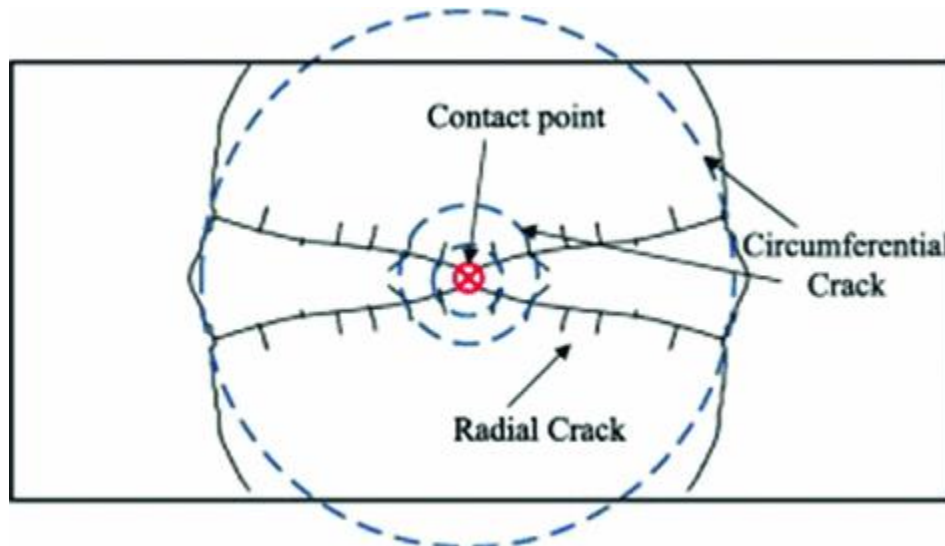
TYPES OF ICE COVER CRACKS

Any ice cover is subject to cracks caused by thermal contraction, movements on the ice cover, and movements of the ice cover on the water. There are eight mechanisms that can cause cracks in ice covers. They are:

- Excessive loads
- Differences in ice thickness and buoyancy
- Snowbanks
- Thermal contraction of the ice
- Thermal expansion of the ice
- High winds
- Water level fluctuations
- Dynamic waves

Cracks do not necessarily indicate a loss in the load bearing capacity of the ice, except where they are wet, or they are radial or circumferential cracks associated with overloading of the ice. The following table describes the crack and the actions required:

Type of Crack	Description	Characteristics and Actions Required
Radial cracks	<ul style="list-style-type: none"> Look like spokes in a wheel 	<ul style="list-style-type: none"> Caused by ice bending due to weight of load, temperature changes, etc. Warning that ice is overloaded, and load may break through ice Immediately remove the load from the ice
Circumferential cracks	<ul style="list-style-type: none"> Form a circle around the load 	<ul style="list-style-type: none"> Warning that ice is overloaded, and load is about to break through Immediately make sure everyone leaves the area
Connected Radial & Circumferential cracks	<ul style="list-style-type: none"> Form pie-shaped wedges 	<ul style="list-style-type: none"> EXTREME DANGER The ice has failed; if not already broken through, it can do so at any time Immediately make sure everyone leaves the area



ICE SAFETY PLAN

Before starting work on an ice cover, you must have an Ice Safety Plan in place. The Ice Cover Inspection form must be completed for work on ice over 1m deep. Preparing the plan requires that you consider these Do's and Don'ts:

DOs

- DO** Confirm what you plan to do on the ice (where and for how long)
- DO** Confirm the conditions and the limits of the ice cover
- DO** Confirm the weight of the load you plan to put on the ice cover and verify the ice can support it
- DO** Verify there have been no sudden changes in temperature ($\pm 20C$ in 24 hours)
- DO** Consider how extreme cold could affect your equipment
- DO** Consider how extreme cold can impact your personal safety and implement controls
- DO** Confirm maximum load and maximum speed allowed on the ice

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- DON'T** Enter areas of unknown ice conditions or thickness
- DON'T** Overestimate ice thickness
- DON'T** Work alone. When possible, to have spotters and coworkers in area

Work with your Supervisor and client representative to ensure a detailed "Ice Safety Plan" is developed prior to commencing work.

The following documentation must accompany the Ice Safety Plan and be reviewed and signed off with the crew involved:

- Emergency Response Plan including an Ice Rescue Plan Review
- Pre-Job Hazard Assessment (HIAC) – Specific to Work Area
- Ice Cover Inspection Form (to be completed immediately prior to going on the ice)
- Ground Disturbance Checklist and supporting documentation (as required)

Check the Ice Safety Plan for the ice thickness, maximum load, and maximum speed allowed on the ice cover. If you don't know these limits, don't go on the ice. Working safely on ice cover starts with recognizing the hazards and implementing effective controls.

MEASURING AND RECORDING ICE THICKNESS

If working on ice when the water beneath the ice is more than one meter deep, the ice must support the load to be placed on it. An ice test must be completed before work begins and periodically during the work to ensure it is in compliance with the load requirement on the Ice Thickness Inspection Form. Ice thickness is the primary measurement required to determine the safe working load that can be put on the ice (allowable load bearing capacity). Manual measurements are made by cutting a hole in the ice cover with an auger, a saw or an ice chisel and then directly measuring the ice thickness. Measurements are made in a prescribed spacing or pattern to provide sufficient coverage and verify the thickness of the ice cover.

WALKING OR WORKING ON FOOT

Before stepping on the ice, check the Ice Safety Plan for:

- Required minimum ice thickness:
 - There must be at least 10 cm (4 inches) of clear, good quality ice before you can walk on it.
 - If you must be in one area for more than 2 hours, the ice cover must be at least 15 cm (6 inches) thick.
- Local conditions:
 - Ice thickness can vary a great deal, particularly near shore, on a flowing river, or near snowbanks.
 - If there is open water nearby, you will need specialized PPE, ice safety and rescue training.
- Working alone:
 - No one is to work alone when working on ice cover.

DRIVING A VEHICLE

Moving vehicles stress the ice. Never exceed the posted speed limit. Before driving any vehicle on an ice cover, including an ATV or snowmobile, check:

- Required minimum ice thickness:
 - A light duty truck (GVW less than 5,000 kg) requires a minimum of 38 cm (15 inches) of clear, good quality ice

- A snowmobile or ATV (GVW less than 500 kg) requires a minimum of 18 cm (7 inches) of ice cover
- Speed limits:
 - Always drive slower than the posted speed limit. Slowdown when:
 - In bad weather
 - Visibility is low
 - Passing workers, max speed limit is 10km/hr
 - Meeting vehicles coming in the other direction, max speed limit is 10km/hr
- Minimum following distance between vehicles:
 - Vehicles with a GVW under 5,000 kg must stay a minimum of 200 X ice thickness apart (e.g., A 4,500 kg vehicle on ice 1 meter thick, must be (200 X 1 meter) or 200 meters distant from next vehicle)
 - Vehicles or equipment heavier than 5,000 kg must stay a minimum of 500 X ice thickness apart-(e.g., A 5500 kg vehicle on ice 1 meter thick, must be (500 X 1 meter) or 500 meters distant from next vehicle)
- Special conditions:
 - Along the route such as areas under repair, thin ice caused by river currents, snowbanks, or near shores
- Passing limits:
 - A loaded vehicle must never overtake and pass another loaded vehicle travelling in the same direction
- Disabled vehicles/equipment:
 - Must be moved off the ice cover as soon as possible

EQUIPMENT CONSIDERATIONS

- When working on ice, equipment is to be equipped with escape hatches and Falling Object Protective Structures (FOPS) should be removed
- Operators should assess conditions and ensure methods of egress are in working order
- Operators are to use their own discretion around using seatbelts and the status of their door while working on ice or ice covers
- Exclusion zones or restricted work areas should be identified if ice cover conditions are not safe for the planned work

****Note – Anytime the ambient air temperature has been above 0° for over 48 hours the normal allowable weight for any ice thickness should be reduced by 50%****

PERSONAL SAFETY EQUIPMENT

When working on ice cover, make sure you have the right equipment for the job and the conditions.

Suggested Emergency Equipment:	Purpose of Equipment:
30 meters of 10 mm polypropylene rope	Rescue others or be rescued if the ice fails
Axe or ice chisel, ice auger, thermometer	Measure ice thickness and air temperature
Two-way radio/ phone	Stay in contact with workers/supervisors and call for help
Warning devices (pylons, reflectors, flares)	Warn others of dangerous areas and attract attention in emergencies

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Roadside Emergency Kit (extra clothing, flashlight, food, etc.)	Keep yourself warm and dry in the event of an emergency
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DETAILS TO CONSIDER IN EMERGENCY PROCEDURE PLANNING

In case of an emergency on the ice that threatens your own or someone else's safety use the following procedure:

- Stop all work in the area
- Call for help
- Rescue the victim if safe to do so
- Provide first-aid and CPR, as needed
- Protect against hypothermia (dry clothing, sleeping bag/blankets, sweetened hot liquids)
- If necessary, transport to nearest medical facility
- Clear area to provide access for rescue vehicles
- Mark and close incident site and area to warn others of the potential danger

SELF-RESCUE IN FREEZING WATER

If you fall through the ice you have time to rescue yourself. You have about 10 minutes to get out of the water before your muscles lose the strength to get you out. Eventually you will lose consciousness, slip below the ice, and drown.

- **Entering the Water:** For the first minute, you will gasp for air. This is in reaction to the extreme cold. After one minute the gasping will lessen, your skin will numb, and the feeling of intense cold lessens.
- **Tread Water:** Do not panic and thrash about. Once the gasping has lessened, slowly tread water, and grasp the edge of the ice to keep your head above water.
- **Kick and Pull:** Keep your hands and arms on the ice and kick your feet. This will bring your body into a horizontal position, parallel to the ice surface.
- **Horizontal Kick and Pull:** Once you're horizontal, continue to kick your feet, while pulling with your hands. Draw yourself up onto the ice.
- **Roll onto the ice:** Keep your weight spread out as you roll, crawl, and slide to reach ice that can support your weight.

TEAM RESCUE IN FREEZING WATER



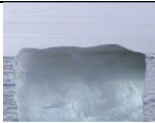

Where more than one person is available to perform a rescue, one person shall immediately contact Supervision to mobilize medical and/or rescue support.

- **Preach:**
 - Shout to the person to get their attention.
 - Encourage the victim to relax, keep their head above water and control their breathing.
 - Let the victim know there is plenty of time and they need to be under control and follow directions.
 - Coach the person through the self-rescue techniques as listed above.
- **Reach:**
 - If the victim is unable to self-rescue, determine if you can physically reach out to the person without going on the ice yourself.
 - Use a rope, sling, ladder, pole, etc. or anything else handy to extend within reach of the victim.
 - Always use something between yourself and the victim; do not make direct body contact unless trained to do so.
 - If it's a rope or sling, have the victim wrap it around one arm multiple times instead of trying to just grip it.

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- If it's a ladder and their grip is weakened, turn the ladder on its side so they can hook an arm through it.
- **Rescue:**
 - Do not go onto the ice yourself unless you are confident the ice will support you.
 - Stay on the path the victim took to get there as it supported their weight up to that point.
 - Approach only as close as needed to get the rope, sling, ladder, or pole within their reach.
 - Approach on all fours, (hands and knees) or by crawling/sliding across the ice.
 - Once the victim has contact with whatever you have extended to them have them perform the self-rescue techniques (lower head, kick with feet) while you pull from your end.
 - If while pulling you are moving towards the victim, you should let go and regroup.
- **Post-Rescue:**
 - Administer first aid and CPR, as needed.
 - Follow procedures to control/prevent hypothermia (dry clothing, warm blankets, hot liquids).
 - Call for help (air or road ambulance).
 - Transport to nearest medical facility, if necessary.
 - Clear the area/road near the incident site to enable rescue vehicles to reach the victim.
 - Cordon off the incident site on the ice with brightly colored or reflective pylons to warn others of the potential hazards.

ICE COVER INSPECTION FORM REQUIRED FOR WORK ON ICE OVER 1M DEEP

ICE COVER INSPECTION FORM									
INSPECTION DATE:					INSPECTED BY:				
THIS INSPECTION MUST BE COMPLETED DAILY WHEN WORKING ON ANY ICE COVER.									
CLIMATE CONDITIONS					VISIBILITY FACTORS				
Current temp.					Clear				
Calm					Fog				
Snow					Light				
Rain					Dark				
Wind					Other				
Other									
Type of ice				Depth of ice cover					
	Blue ice – freshwater lake ice					COMMENTS:			
	Blue ice – river ice					COMMENTS:			
	White ice – constructed flood ice					COMMENTS:			
	Muskeg – peatland <ul style="list-style-type: none"> • Highly variable over entire area • Strength varies • See best practice on matting 					COMMENTS:			
EFFECTIVE ICE THICKNESS Determine total weight of equipment, vehicles, and people who will be working on the ice surface at any one time. Use the chart below to determine minimum ice cover required for moving or stationary loads. **Note – Anytime the ambient air temperature has been above 0° for over 48 hours the normal allowable weight for any ice thickness should be reduced by 50%**									
Moving loads: crossing ice surface					Stationary loads: working on ice surface				
	LAKE		River			LAKE		RIVER	
One person on foot	5 cm	2"	6 cm	2"	1000 kg	20 cm	8"	23 cm	8"
Group, in single file	8 cm	3"	9 cm	3 1/2"	2000 kg	30 cm	12"	35 cm	14"
Light Truck – 2500kg	20 cm	8"	23 cm	9"	4000 kg	45 cm	18"	52 cm	20"
Medium Truck – 3500 kg	26 cm	10"	30 cm	12"	8000 kg	60 cm	24"	69 cm	27"
Heavy Truck (7000-8000 kg)	35 cm	14"	41 cm	16"	25,000 kg	110 cm	43"	127 cm	50"
10,000 kg	38 cm	15"	44 cm	17"	45,000 kg	150 cm	59"	173 cm	68"
25,000 kg	63 cm	25"	73 cm	29"	70,000 kg	180 cm	71"	207 cm	82"
45,000 kg	80 cm	31"	92 cm	36"	110,000 kg	230 cm	91"	265 cm	104"

DEFINITIONS

Natural Ice "Blue Ice": Ice that grows below the layer of surface ice under calm conditions. Usually formed of vertical, columnar crystals containing few air bubbles.

Natural Overflow Ice: Caused by natural water overflow onto the ice surface. Usually contains high air content and is not relied upon in calculating effective ice thickness.

Constructed Flood Ice: Constructed by pumping water directly on the surface of a bare ice sheet to build up the ice. If good construction practices are followed this ice can have similar strength as natural ice.

River Jam Ice: Ice cover formed irregularly on rivers, normally due to the higher flow rate present on rivers. Usually caused by large pans of ice stacking atop one another and freezing in place. May be good quality ice, however thickness may be highly variable.

Spray Ice: Constructed by spraying water high into the air and forming a wet slush layer on the surface of a bare icesheet. Good construction practice using this method, once ice is completely frozen and inspected, ice can be considered as having similar strength to natural ice.

Effective Ice Thickness: The thickness of good quality, well-bonded ice that is used to calculate the bearing capacity of the ice cover. Unless otherwise stated, the minimum ice thickness measured at a particular test point will be used as the effective ice thickness.

Gross Vehicle Weight (GVW): The total weight of a vehicle when loaded, including the weight of the vehicle plus fuel, freight, passengers, attachments and equipment. Weighing the fully loaded vehicle on a scale is the most accurate way to determine the GVW.

Ice Cover: The portion of an ice surface that is floating (buoyant) on a river, lake, pond or peatland and that is capable of carrying an external load.

Ice Profiling: The technique used to measure the thickness of floating ice. Manual Ice Measurements by drilling holes through the ice and taking direct physical measurements of the ice thickness is standard procedure.

Ice Road/Bridge: Seasonal crossing over frozen lakes, or over or along a frozen river for the purpose of transportation. Usually consists of floating ice and ice that is frozen to the ground.

Tare Weight: The empty weight of a vehicle or piece of equipment.

Operational Tare Weight: The scaled operating weight of a vehicle or piece of equipment. This weight will include the combined weight of the equipment, associated attachments, the operator and a full load of fuel.

REFERENCES / ADDITIONAL INFORMATION

CEPA Working on Ice Covers Sub-committee guidelines

Transport Canada Ice Safety Guidelines Chapter 5-3

AB OHS Code

Part 12 Section 195 – Working on Ice

British Columbia OHS Code

OHS Regulation Part 4: General Conditions

Saskatchewan OHS Regulation

Part 3-23 Work or travel on ice over water, etc.

Manitoba OHS Code

Part 22.33-22.37 - Working on ice



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