Safety Guide for Operations on Ice

Introduction

According to information posted on the Internet, there are two old sayings about crossing ice, "thick and blue, tried and true - thin and crispy, way too risky," and, "when in doubt, don't go out." Before deciding to cross ice it is important to spend the time to assess the conditions. Remember, what looks safe from the shore may end up being very dangerous quickly.

Assessing the situation

1. Look closely at the ice before setting foot on it. The strongest ice will appear a clear blue or blue black and be free of snow, air bubbles or debris. Weak ice (also known as 'rotten ice') is white, brittle, mixed with snow, or filled with air bubbles.

2. Consider factors such as water currents and depth, snow cover, and temperature, which can all effect ice strength. For large bodies of water it will take two or more weeks of below freezing temperatures to make ice capable of holding up a large amount of weight.

3. New ice is stronger than old ice.

4. Looking at the surface is not a good way to gauge ice thickness. The only way to verify the thickness is by cutting a hole in the ice. Be sure you continue to make more test holes as you move further away from shore.

5. As you measure ice thickness, consider that table below:

Description and thickness[1]	**Strength**	**Other**
clear blue ice, < 3" thick	Unsafe, can break anytime under the weight of an average person	Do not traverse
clear blue ice, 3-5" thick	Capable of holding up a human	Groups should spread out as traveling together will stress the ice
clear blue ice, < 6-8" thick	Capable of supporting a group of people or equipment like a ski mobile	Minimum thickness needed for group activity
clear blue ice, < 8-12" thick	Capable of holding the weight of a car, but why risk it	A car creates a pressure wave a when it crosses the surface of the ice. If the water is four feet deep driving any faster than 9 mph could shatter the ice around you.

6. Some work on ice may involve encounters with dangerous wildlife, such as leopard seals and polar bears. Be sure to consider these kinds of unusual hazards when developing your project's hazard assessment and mitigation plan if they are applicable to your work site.

[1] Note: River ice is usually 15 percent weaker than pond or lake ice.

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Ice safety

Ice strength is dependent on appearance, thickness, daily temperature, ice history, and snow cover, plus water depth under the ice, the size of the water and water chemistry, currents, and distribution of the load on the ice. Additional points to consider:

- **Don't judge ice strictly by appearance**. Ice can change with the surrounding climate conditions. Temperature, precipitation (such as snow, sleet, rain), wind speed, ice age, water depth and water quality are all factors that affect ice strength and thickness.

- **New ice is usually stronger than old ice** because bonds between the crystals decay with age making the ice weaker even if melting has not occurred.

- **Ice thickness over a body of water is not constant**. Water currents, particularly around narrow spots, bridges, inlets and outlets, are always suspect for thin ice. Beware of ice around partially submerged objects**,** such as trees, logs, brush, embankments or dam structures.

- **Snow** can act like a blanket insulating the water below. Snow can insulate ice and keep it strong. It can also insulate it to keep it from freezing. Snow cover also hides the surface and can mask rotten ice and thin spots. You should always be cautious when moving across snow-covered ice.

- **Springs and currents** can create areas of extreme thickness and patches that are just wafer thin.

- **Wind speeds** influence ice formation. Light winds speed up the formation. Strong winds force water from beneath the ice and can decay the edges of the ice.

- **Air temperature influences the quality of ice.** A rapid large drop in air temperature may actually make the ice brittle and it may not be safe for more than twenty four hours after this drastic temperature change. Above freezing temperatures for six or more hours in a twenty four hour period can weaken the ice. Staying above freezing for 24 hours or more will result in loss of ice strength to the point where the conditions may no longer be safe. Stay off the ice if this has occurred.

- **Slush** is a danger sign. It indicates that ice is no longer freezing from the bottom and indicates weak or deteriorated ice.

- **Loud cracks and booms** coming from the ice. On river ice this may indicate the ice is about to break up or move. One large lakes (several acres) this may only indicate harmless thermal expansion and contraction.

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- **Cracks in the ice.** Dry cracks indicate the ice sheet has not been penetrated and they are usually of no concern. Wet cracks mean penetration has occurred to the water below. You should double the ice thickness required for each of the activities listed in the table above to ensure safety.

- **Ice forms** at the edges of a lake during the fall and melts at the edges first in spring.

- **Stationary loads.** Under moving loads, ice is elastic (depresses, and then recovers to original position after load passes). In the situation of static loads, the ice surface will continue to sag and depending on strength of the ice cover, may even fail. Signs of failure are radiating cracks from the bottom of the ice beneath the stationary object, circular cracks in the upper layers of ice adjacent to the load and worse case, signifying imminent failure, circular ice shears immediately adjacent to the loaded surface.

Preparation for work on ice over water includes taking into account your physical condition, the weather, your clothing, your equipment and your procedures. Anyone working on ice should be in good enough condition to handle an emergency situation (falling into the water or rescuing someone who has). It is important to be able to swim or at least float. Clothing should provide protection from low temperatures, but not restrict the ability to swim or float. Equipment for testing and measuring ice thickness as well as items to use in rescue, including self-rescue, are critical to any work on ice. Last, but not least, planning for the outing by assessing the risks and mitigating the hazards is paramount.

Remember you take a risk anytime you go out onto ice. Safety practices for work on ice include:

- **Never go alone and never go on ice if there is any question of its safety.** Never attempt to rescue a victim of ice failure alone, because you could go from rescuer to victim very quickly.

- **When planning the outing,** look up the air temperatures for the past several days and continue to monitor temperatures as long as the ice is supporting loads.

- **Before you leave,** inform someone of your destination and expected time of return.

- **When changing locations on the ice always walk at least 10 feet apart from your buddy.**

- **Visually observe the ice from water's edge before starting onto the ice.** Look for evidence of recent thaws, open water, etc.

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- **When crossing a large body of water,** it is always a good idea to drill test holes as you progress out from shore to help judge the thickness and character of the ice.

- **Stay away from cracks, seams, pressure ridges, slushy areas and darker areas that signify thinner ice.** Listen for loud cracks or booms coming from the ice and know what they indicate.

- **Dress for the worst.** Wear layers; insulated, waterproof boots; gloves and a windbreaker. Most body heat is lost from the head and neck, so wear a hat and scarf or face covering. Bring extra clothing, socks and gloves. Clothing that will restrict the ability to swim or float, such as hip waders, should be avoided.

- **Always wear a life jacket or personal flotation device (PFD)** over an ordinary snowmobile suit or layered winter clothing. Life jackets can provide excellent flotation and protection from hypothermia (loss of body heat). Specialized coats that float or dry suits also are recommended. **Never wear a life jacket when traveling across ice in an enclosed vehicle,** however, because it could hamper escape in case of a breakthrough.

- **Assemble a personal safety kit** that includes
  - a lighter, waterproof matches, or magnesium fire starter,
  - pocketknife,
  - compass,
  - whistle
  - **In addition,** carry ice rescue picks, a rope or rescue throw bag and a cellular phone. Even a pair of screwdrivers tied together with a few yards of strong cord can be used to pull yourself up and onto the ice if you fall in, but be sure they have wooden handles so if you drop them, they don't sink quickly.

- **Wait to walk out on the ice** until there are at least 4 inches of clear, solid ice.
  - Contact a local resort or bait shop for information about known thin ice areas.
  - Check for indications that an aeration system is in operation on the lake. Ice forming near these systems will be weaker and should be avoided.
  - Ice can be weakened many yards beyond where it is actually open.
  - Stay well outside the fenced areas indicated by diamond shaped thin ice signs.
  - Look for an area of easy access, free of cracks or other indications of weakness.

- **Avoid driving on the ice whenever possible**.
  - Before putting a vehicle or other equipment on the ice, walk the ice to look for signs of weakness, cracking etc.
  - Traveling in a vehicle, especially early or late in the season is simply "an accident waiting to happen.
  - Don't "overdrive" your snowmobile's headlight. It takes a much longer distance to stop on ice than your headlight shines.

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- Be prepared to bail out in a hurry if you find it necessary to use a car, unbuckle your seatbelt and have a plan of action if you do breakthrough. Some safety experts recommend driving with the window rolled down and the doors ajar for an easy escape.
- Move your car frequently. Parking in one place for a long period weakens ice.
- Don't park near cracks, and watch out for pressure ridges or ice heaves. If you encounter wet cracks, the path should be perpendicular to them rather than parallel.
- Don't drive across ice at night or when it is snowing. Reduced visibility increases your chances for driving into an open or weak ice area.

- **If you fall in try not to panic**.
  - **Turn toward and move slowly** back to where you entered the water. Expect a progressive decrease in strength and ability to move.
  - **Don't try to climb out.** Instead lay both arms on unbroken ice and kick hard. As this action lifts your body, roll onto the ice and away from the hole you fell into.
  - **Once on the ice** push yourself forward on your stomach toward more solid ice or roll on your side to attempt to distribute your body weight evenly.
  - **Do not stand up** until on the ground or an area of solid ice. Crawling will help keep weight more evenly distributed.
  - **If you cannot get up on the ice, stay calm.** Do not attempt to swim (which will cause body heat loss much faster than staying as still), unless a boat, floating object or the shore is nearby.
    - Use a whistle to attract help.
    - Act slowly and deliberately to conserve heat.
    - **Remember HELP** (Heat Escape Lessening Position). Bring your knees to your chest and with arms at sides, clap your hands. If possible cover your head. If more than one person is in the water, huddle to conserve heat.
    - If you are wearing a snowmobile helmet and your face is in the water, remove the helmet as quickly as possible because it can fill with water and cause you to drown. Hold onto it to keep afloat.

- **To help someone who has fallen in**
  - **Call 911**
  - **Do not go on the ice unless you are already there.** Instead **remember Reach-Throw-Go**. From a safe distance on solid ground, throw a rope or extend a branch, pole, etc. If you are unable to reach the victim from shore, go for help. A nearby boat may be able to assist.
  - **Don't stand during the rescue.**
  - **After securing the victim**, wiggle backward onto more solid ice.
  - **Administer first aid** as necessary until medical help arrives.