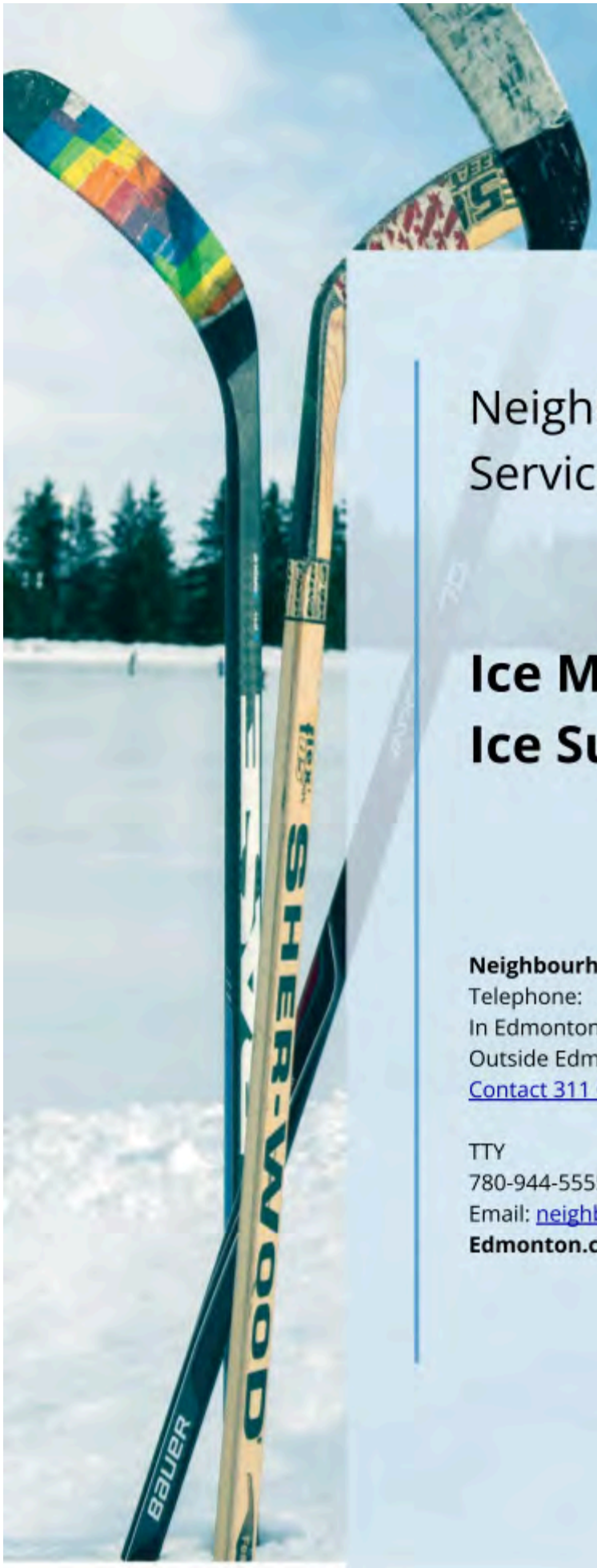

Neighbourhood Services

Ice Making for Outdoor Ice Surfaces

Neighbourhood Services
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In Edmonton: 311
Outside Edmonton: 780-442-5311
Contact 311 Online

TTY
780-944-5555
Email: neighbourhoodevents@edmonton.ca
Edmonton.ca/neighbourhoodservices

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This handout is based on the outdoor ice-making workshop designed and instructed by Henry Stainthorp, ice maker for over 35 years, with additions from other instructors who have assisted in subsequent years. Any recommendations are those of the presenters and do not reflect the views and opinions of The City of Edmonton Community Services Department. All content of this manual is for informational use only. Please use all information and recommendations at your own risk and liability.

ICE MAKING FOR OUTDOOR SURFACES

1. Rink Surface Area Types

Rink Areas - 3 Common Types of Surface:

Grassed Rink Area

- Level to 1% slope allows water runoff when the ice melts in the spring.

**The City does not recommend using a tarp due to the damage to the turf, which the City has started to charge groups to repair.*

Asphalt Rink Area

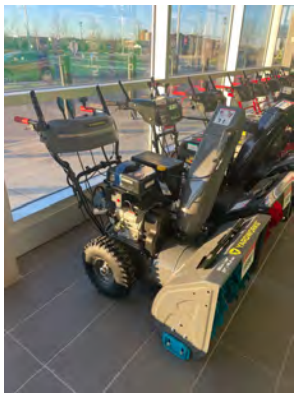
- It is easier to make ice on asphalt than on grassed areas.
- Asphalt will absorb sun's rays on a sunny, warm day and melt the ice on the south and west facing areas unless you place white sheets or white plastic sheets in these areas before you make the ice. The white sheets or plastic needs to extend approx. 10' (3m) from south facing boards and 3-4' (1-1.2m) from west facing boards.

Concrete Rink Area

- Nice but cost prohibitive to build.

2. Equipment & Equipment Maintenance

Picture	Name	Description
	**Hoses**	• The best hose type to use is a 1"(25mm) ID (Inside Diameter) Red Rubber Hose (can be purchased at Red-L Distributors Ltd). ○ *We do not suggest using a Fire Department's hose, which is 2"(50mm) in Diameter. This type of hose is harder to handle and will freeze to ice once the hose starts to wear and once wet.* • Use Cam-Lock Couplers (Red-L) to connect hose sections. • 30' sections of hose are best and easiest to handle. • Should have enough hose to reach from your water source to the farthest end of your rink (approximately 200'/61m).

	**Nozzles**	• Use an adjustable Red Nozzle (available at Gregg Distributors, also Red-L). • Not all nozzles are created equal. Watch for a nice, consistent spray pattern. *This is ideal for light flooding.*
 	**Snow Thrower/Blower**	• Ensure the equipment is serviced every year. • Many ice makers prefer the Ariens brand.
	**Sweepers**	• The best equipment to get the ice clean before a flood. • Key piece of equipment for smooth ice. • Broom rollers – Usually 26”(660mm) long when new –. *Replace at 21”/533mm (after 5”/127mm of wear).*
	**5 Gallon(19L) Pail on Wheels**	• Used to make slush to fill cracks and holes in the ice. • Use newer style mop buckets with wheels to pull or push rather than carry across the ice.

		
	**Rasp (Medium)**	• Used to smooth off splinters and edges of damaged boards.
	**Snow Scraper**	• A must-have if you don't have a sweeper. • Have lots of them on site so that others can help! • Ensure they are not too heavy to push.
	**Scoop Shovels**	• Required to scoop snow off ice plus smaller flat shovel used for crack and hole repair. Metal edge shovels work best.

	**Hammer**	• Used to pound in protruding nails if you have boards.
	**Axe**	• Used to chip out ice around rink boards for easy replacement of boards and to remove excessive ice build-ups.
	**Ice Rink Snow Shovel**	• Used to push snow in a steady path.
	**Squeegee**	• Used to push excess water around and used for spot repair.

Equipment Maintenance

You should do annual services before the start of the season, which include:

- Oil change
- New Spark Plug(s)
- Lubricate any and all applicable areas
- Tighten all nuts and bolts (use Lock-Tite)
- Wash equipment so it is ready for season

3. Preparation In Fall Before Flooding

Grass rinks with a perimeter wooden or plastic board enclosure:

1. Repair or replace any damaged, rotten or splintered boards in the rink boards (wood or plastic).
2. Ensure that gaps between boards do not exceed 1/3”(9mm) (the thickness of a hockey skate blade).
3. Hammer down and flush any protruding nails and screws in the rink boards.
4. Paint or repaint any boards that require it - oil based paint is best.
5. Mow the grass as short as possible in early October and remove all grass clippings and leaves from the area.
6. Encourage soccer practices in the rink (they pack down the grass, which makes a better surface to start with.

Note: Wood Boards typically last about 6-12 years depending on maintenance. Puck boards are recommended along the base of the boards. This is usually a specialized plastic from rink product suppliers. Ensure you use outdoor plastic, not the indoor variety.

Snow Bank Rinks (rinks in which enclosures are made of snow and water banks).

1. Mow the grass in early October. Remove any loose grass clippings and leaves.
2. Once it has snowed, clear your skating area to four sides to define the flooding/ skating area.
3. Encourage soccer practices on the turf (they pack down the grass, which makes a better surface to start with.

** See Ice Building Stage for the next steps.*
** The City does not recommend using a tarp due to the damage to the turf, which the City has started to charge groups to repair.*

4. Ice Building Stage

General Tips

- Never flood when snowing.
- Cover Metal hose connections with a cloth if they touch the ice surface. This will stop the metal from melting the ice in those spots.
- When turning on the hose, make sure your nozzle is open a little so you can maintain control of the hose at all times.
- Leave the nozzle open at least a little if you leave the rink during a flood. This will ensure the hose does not freeze.
    - Try not to leave the hose running in one spot. This will cause the ice to melt (this does not take long).
- For high-use areas, place puck board and north exposure; place white puck board or plastic sheets.

Preparing the Surface

- You can pack or remove the snow, BUT the best is to remove all the snow. You can flood over a skiff of snow no more than ½" (13mm) and not when it is snowing.
- Put up a sign during the Ice Building Stage; "DO NOT USE ICE - ICE TOO THIN." – No one should use the ice while it is being made and until you have 1" (25mm) minimum of ice thickness.

For SnowBank Rinks and Grass Base Rinks:

How To Start?

- First, decide how large the rink will be and step it out. If the ground is covered with snow, clear it by pushing to individual sides, which will make the outlining snow banks at the same time. Banks should be clearly definitely at the ice level to prevent rough edges and tripping hazards.
- Next step is to pour water on when really cold (ground frozen). We suggest not using a nozzle so we can get maximum water delivered. Cover the entire rink area, and once frozen, repeat a number of times until a base of approximately 2" of ice is built up, trying to maintain flooding as uniformly as possible.

Snowbank Rink surface preparation.

Sample flooding technique.

Puck board on grass in high use area before flooding

- Individual floods need to have enough time between to allow for complete freezing of the previous flooding. Really cold temperatures may allow almost constant flooding (one end will be frozen before you finish the other).
- The first floods will look ugly and chunky, but keep flooding layers at a time.
- When a sheet of ice covers the entire area, it should be level with no bare spots or humps and bumps.
- From then on, use the nozzle on the end of the hose when flooding. A spraying effect will do the finishing touches to your ice.

- For high use areas place puck board and north exposure place white puck board or plastic sheets.

Rink Boards

- It is very important to ensure the board edges and fencing have been cleaned off. If a wind comes or something knocks the snow onto your freshly flooded rink, it will make for uneven and bumpy ice.

Maintenance

Daily

- Check for Protruding Nails or Screws.
    - Hammer in nails or twist in screws.

- Check for Splintered Wood or Rotten Boards.
    - Repair splintered boards by nailing them together and then filing, if possible, using a medium rasp.
    - Replace if necessary.
    - Use Spiral Ardox Nails, as they hold better than regular nails.
    - Flatten the point of the nail before using, as this will reduce the possibility of splitting the board.
    - Replace rotten boards by chipping ice out around the rotten board. Then remove the rotten board and replace it with a new painted board.

Weekly

- Check for ice accumulation on the dasher boards. Remove before flooding.

Asphalt Rinks

- Put white sheets down on the south and west facing surfaces before you start flooding – this will decrease the possibility of the ice melting on a warm day.

- Pebble (shoot water from the nozzle up into the air, letting it fall like rain) the surface to create a crust of ice to ensure a good bond to the surface.

Flooding

Base flooding techniques

You can flood from 0 C to –20 C.

- Good temperatures are -5C to -15C.

- Best temperatures are -7C to -10C.

- Temperature should never be greater than 0 C on a day that you are flooding unless you have a thick solid base. Light floods on warmer days will work, but they must be very light and will take longer to freeze.
- Flood every day during the ice building stage.
- Always do light floods – a 190’ x 85’ (58m x 26m) rink should take about 15-30 minutes (30 Minutes Maximum).
- Approximately 60 - 80 floods = 1”+ ice thickness.
- After 3-4 days of flooding (four hours per day), you start to see progress.
- You should always be at least 10-15’ (3 - 4.5m) away from where the water hits.
- Learn how to pebble. It will come in handy in many situations. To pebble, shoot water from the nozzle up into the air, letting it fall like rain. Nozzle should be at 45 degrees with a light flow.
- Always work from the boards back to the centre of the rink.
- Do not let the water hit the boards.

Base Building Flood Pattern (Initial Flood)

- You can flood over top of the hose in the initial floods.
- Don’t have the hose on top of the hose. It moves better when it’s just on the ice. The hose can bind if it is lying on top of itself.
- Use a 1.5’ to 2’ (0.5-0.6m) wide water spray.
- Ice must be frozen before you coat again.
- Aim for 4-6 floods per day.
- Start approximately mid-November.
- Ice making will take ~2 weeks, depending on the weather. The 2-week estimate is based on the temperature being at or below 0 C every day.
- Use a Rain flood to build and maintain the ice. This means High trajectory - use a 45 degree angle from ice to nozzle. Sweep the hose/nozzle in an arc and always walk backwards away from the area you flood.
- Wet ice is very slippery ice. Be careful and consider wearing shoe anti slip cleats.

Highly recommended: Use the Lazy Eight method found in Routine Ice Maintenance for all stages of ice making.

Benefits of Light Floods

Heavy floods go under the boards.
All surfaces are best to only light flood.
Heavy floods move as they freeze, which makes ripples and cracks.

- Several fine sprays should be applied before proceeding to a heavier spray. If the weather is cold enough, i.e. -7° C to -15° C, spraying can likely be continuous, as the first coat will be frozen almost immediately.
- However, additional sprays should not be applied in warmer weather until the previous one is thoroughly frozen.
- Once the ground has been completely sealed and the water will not run away, the levelling of the ice can begin.
    - Using a heavier spray, repeat the previous procedure, applying as many coats as may be necessary to ensure the low spots are filled in gradually, as shell (shale) ice may result if too much water is applied at once. If some spots are particularly low, it may be best to apply water only to those spots until they are built up close to level.

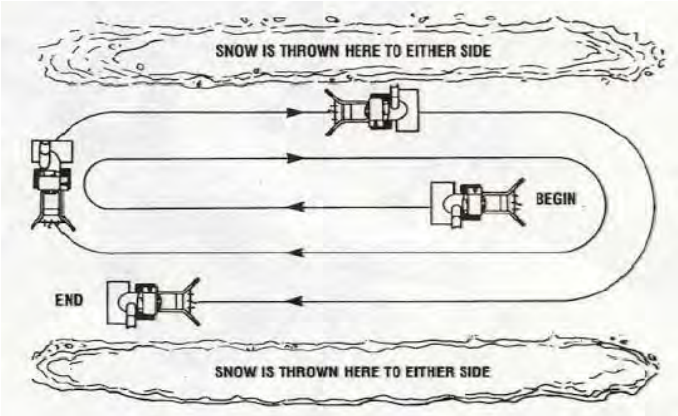
Routine Ice Maintenance

- **Snow removal:** Use the snow thrower, then sweep.

Always fill the sweeper and snow thrower with gas before bringing it on the ice.

Start in the middle of the ice and work both ways (see diagram below).

The discharge chute stays in the same direction except when turning. Snow is thrown to each side

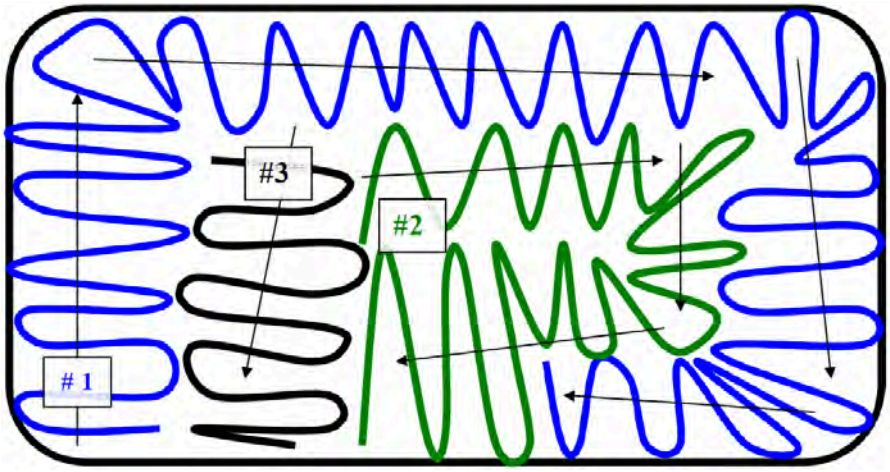


- Sweep the snow into a windrow near but about 2-3 feet (0.6-1m) away from the boards. This is to make it easier to blow over the boards.

Remember: *Always finish removing the snow that you start moving (either by sweeping or snow thrower). Even if it starts snowing, finish removing what you started. Snow left that has been disturbed will become very hard and will be difficult to move the next day.*

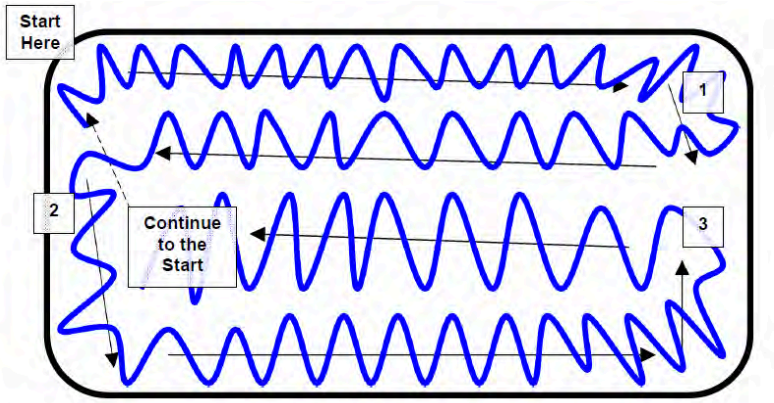
Key:
1. Ice must be clean before you flood.
2. Use light floods!

Maintenance Flood Pattern



- **Light Floods Build Strong Ice!** – You want to build your ice layer by layer. Going fast can cause many problems such as air bubbles trapped in the ice. Strong ice will help with ice retention as it gets warmer.
- **Do not Flood Below -20 C** – Will the water freeze? Yes, but it will be of a poor quality. Ice cracks too easily at this temperature.
- **Listen to the Sound of the Ice** - If you can hear it cracking, usually because it is too cold, stop. You will cause more problems for yourself in the future. Let it warm up.
- **Do not Flood when it's Snowing** – This will make poor quality ice which you will battle with all season.
- **Stop Flooding if it Starts Snowing** – Same as above.
  Be patient and do it right. You will be glad you did.
- **Walk Flat on the Ice** - Lean slightly forward when flooding to keep your balance. No heel to toe.

Lazy Eight Flood – General All Purpose Flood Pattern



- This pattern can be used to build the base or for maintenance.
- It will allow you to continually flood as long as you want depending on the weather and temperature outside.
- Spray water using a circular or back and forth motion. The water should splash on the surface and not pool for best results.
- Start in a corner of the ice and spray while moving backwards. You should be covering 25% of the ice surface.
- At Turn 1, begin moving up the centre portion of the ice covering the next 25% of the ice.
- At Turn 2, follow the boards to the outside section of the ice along the far boards, not up the centre again. Cover 25% of the ice.
- At Turn 3, move back into the centre and cover the last 25% of the ice surface. From the Centre, you will be able to continue spraying to the original starting point and begin the Lazy Eight again.
- If the water is not freezing by the time you come around again, decrease the amount of water flowing from the nozzle to allow for freezing. At ideal temperatures and with experience, you can even flood open hose with continuous freezing using the Lazy Eight.

5. Issue Management

Rink Rot

Picture of what can happen if you flood before clearing debris from rink surface. Foliage is rotting under the layers of ice and causing a swell.

Picture of rink rot. Leaf that was not removed before flooding is decomposing and causing discolouration and ice swell.

- Remove all leaves and dead material.
- You may think a leaf here or there will not cause a problem. Leaving a single leaf can cause "Ice Rot" in your surface.
- As the sun shines down on your surface, the leaf will collect more energy than the surrounding ice. This will cause the ice above and below it to melt. You will need to continually work repairing that yellow pothole that it will create.
- When you finally decide that you should remove the leaf, as many do, you will find that the freeze-thaw pattern has caused the leaf to rot under the ice. Many have reported a horrific smell from this. Remember to always clear your ice before flooding. This is important for every layer.

Ice Repair

- **Cracks form as a result of temperature variations, and when it is too cold, the skates also crack the brittle ice.**
    - All holes and cracks (over ¼"/6mm wide) in the ice need to be repaired before flooding.
- **Use a 5-gallon (19L) bucket (preferably on wheels):**
    - Fill the bucket ½ full with warm water and then add fresh snow to make a thick slush.
    - Use the "Slush" mixture to patch holes and cracks in the ice.

- **The Technique to fill is:**
    - **Splat**: Use the shovel to place some of the slush to fill the crack or hole.
    - **Compress** the slush into the crack or hole with your foot.
    - **Scoop** any excess off the ice with your flat-bottomed shovel or trowel.
    - **Spray** flood as you would the whole ice surface with a fine light spray. Depending on the repair, you may need to spray the area a few times, leaving 1 hour to freeze between each time.
    - **Squeegee** (If you can keep it in warm water) You can go over the spot with a warm wet squeegee to smooth the surface.

If you have Running Water Under Boards:

- If you have water running under the boards you have a few options for how to fix this:
    - Get some snow and pack the snow against the boards. Spray lightly with water until you have a build up of ice.
    - You can use thick slush as mentioned in the Ice Repair section. Once in place, you spray lightly with want to keep building on it.
    - You can use wet newspaper if there is a large gap to fill the gap, cover with slush mix and spray lightly

Hockey Nets:

- Do not leave hockey nets on the ice if they are not being used. The metal will melt the ice and cause issues.

6. Different Ice Amenities or Features

Line Making

- You can use ice paint (available at rink or curling supply stores) for any lines. For the amount you will use, we suggest you purchase tempera paint from the dollar store (the same that children use in elementary school).
  **Do not use paints with oil in them as it will cause problems with your ice.*

- You can use wool for lines by stretching the wool across the ice and freezing it down, then painting between the lines.

- Do not use paper for lines and circles. The sun will melt under the paper and leave air pockets.

- It is advisable to water down the paint with warm water to give a faint colour to the lines. If the paint is too thick, the sun will heat the paint which will melt the ice above it faster than the surrounding ice.

- To paint lines, you can use a curling broom (available at rink supply stores). A foam brush will work just as well, and you will save money.

- Paint lines earlier in the process. A good level to do them is around 2 inches (5cm). You want more ice above the lines than below them.

- You can find the proper dimensions for ice lines on the internet. Adjust them accordingly for your ice surface size.

Have fun and change things up for the users of your rink from year to year!

- **Crokicurl** - It is a game created in Winnipeg that combines both curing and crokinole. There are many resources available online.
- **Curling** (milk jug curling is affordable and accessible)
- **Skating Trail**
- **Hockey Lines**
- **Have a Paint Party!** Allow residents to paint any designs and pictures on the ice. This is a great activity, especially towards the end of the season.

Frequently Asked Questions

What is the size of an NHL Hockey Rink?

- A regular hockey rink is 200’ x 85’.

How much water will we use?

- Although each surface is unique and each rink a different size, the following is a hypothetical situation based on the actual experience of local groups using a grass surface with boards that may help.

- We participate in the EPCOR Hydrant Permit Program which costs $50 per month for the meter rental. Water costs are calculated by the volume in cubic meters (m3) times the cost per m3 during the billing month.

- Our rink is full size – 200ft x 85ft (61 m x 26 m). We put down at least 10” of ice (25 cm) because the ground is so uneven. This works out to 396.5 m3 of water – assuming nothing leaks sinks into the ground, or evaporates. To put this in perspective, approximately 33 full-size tanker trucks of water, 198 hot tubs or 1.5 lanes of an Olympic-sized swimming pool!

- Knowing the volume, you can ask your water supplier for the cost per cubic meter to calculate your estimated cost for the season as you see above.
- Remember, if you have a hall/rink building you can cut your water costs by asking for a second meter to be installed to be used specifically for your rink. The meter will allow you to pay for water without paying the additional drainage fees.

7. Acknowledgments

Thank you to Ryan Jefferson for updating this manual and instructing the 2017 - 2023 Ice Making Workshops.

Thanks to Henry Stainthorp and Dean Lack (DCL Resources Ltd) for helping compile and format the original version of this document.

Neighbourhood Services
Social Development | Community Services
City of Edmonton

Last Update: January / 2025