



*Saskatchewan Parks and
Recreation Association Inc.*

Parks and Open Space Management

Ice Making and Maintenance Handbook





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Introduction and Disclaimer of Liability for Use of the Document

This Parks and Open Space Management Handbook, provides a description of procedures associated with maintenance activities performed within park settings.

The concept of maintenance standards requires the application of best practices within the local operation system. To assist with the establishment of such standards, this resource provides guidelines to aid staff in addressing their daily management operations. There are, however, situations where the standards outlined may require revision by those staff implementing the procedure, to best meet their needs. Specific site conditions, operating budgets, available human resources, and capacity to offer training associated with the practices outlined in this document may warrant alterations to the procedures.

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Ice Making and Maintenance Introduction

My crew and I were just beginning our day of cleaning and flooding the outdoor rinks. Last night it started snowing early in the evening and had carried on throughout the night. I knew then that it meant that today we would have to clean the ice before we could flood it. Sure enough, Mother Nature had left us with a fresh 3" blanket of sparkly new fallen snow.



After finally removing all the snow on the ice we could now begin the flooding process. I called out to Larry; "My granddaughter has a request for us today." The guys looked at each other perplexed.

I explained to them that last night I had taken my granddaughter to the neighbourhood rink for her first skating lesson. Although she was hesitant at first, after about 20 minutes she was refusing the assistance of the stool I had brought for her to steady herself with. After a few falls, she undoubtedly learned how unforgiving the ice could be. After the fall that ended her first skating lesson, I was comforting her and she looked up at me with her big blue eyes, and between sobs she asked, "Could Larry make the next layer of ice softer?"





Ice Making and Maintenance Introduction Continued...

As we were walking home from the rink Amanda had gotten ahead of me and I could see that the back of her ski pants were soaked and torn. She was already talking about the next time she would go skating...she was going to be the next Kristi Yamaguchi. I told the guys about joking with her that she would know when her skating abilities improved by how wet her ski pants were at the end of the lesson.

"I will see what I can do to accommodate our next Kristi Yamaguchi. I think it would be easier for her to learn not to fall though", Larry said with a grin.





Ice Making and Maintenance Overview

Thanks to the great efforts of Maintenance Workers crews, residents and visitors are able to enjoy community outdoor ice rinks, lake skating rinks and a speed oval.



Never built an ice rink before? Well relax. Today you will learn what the procedures are for building the base ice, how to maintain the ice surface by cleaning when required, and flooding regularly. I will give you a heads up, however, you will have to pay attention because the procedures vary depending on whether we are talking about a regular outdoor rink, a lake rink, or the speed oval.

You have probably already guessed that if the procedures vary depending on the type of rink, so would the equipment that you use...and you are right!

The ice surfaces of all the rinks are cleaned using the blade truck, and a shovel. On the occasion that we receive a heavy snowfall you may have to use a snow blower to aid in the removal of the snow. Your experience and knowledge have taught you that all ice surfaces must be cleaned of snow before you are able to begin the flooding process.





Ice Making and Maintenance Overview Continued...

When you are flooding the outdoor ice at the hockey and skating rinks you will use the blade truck. It has a hose on a reel in the box of the truck that is hooked up to park standpipes or fire hydrants as a water source when flooding the rinks. For the lake rinks and the speed oval you will use a water-truck, which has a large water tank on the back that you use to flood the ice.





Your Day Begins...





Safety Equipment Overview

From your past experience you know the importance of wearing the correct clothing and safety equipment. You recall the standard safety gear used by Maintenance personnel.



Safety Gear

CSA Approved Safety Boots (Insulated) - Required

Outdoor Weather Gear - Required

Safety Glasses - Recommended

Two-Way Radio - Required for lake ice

Cleats - Recommended

Ear Plugs - Recommended





Cold Weather Protection for Working Outdoors

The impact of weather on an employee's safety should always be considered when working outdoors, especially during the winter. Snow, ice and cold raise additional safety concerns.

Exposure to cold can make muscles more susceptible to strain; it not only diminishes strength and dexterity in the fingers and hands, but also tends to make workers have short, jerky motions when handling materials. Extreme cold can cause frostbite on exposed body parts (nose, ears, etc.) and on the extremities (fingertips, toes, etc.). Hypothermia, even in a mild form, can cause errors in judgment.

Here are some tips to help prevent frostbite and hypothermia:

- Make sure that you are wearing appropriate clothing for the weather conditions.
- Keep some extra clothes on hand like socks and gloves so just in case these items get wet, you can replace them with the dry gear.
- Take breaks more often and warm-up. Refer to the Occupational Health and Safety (OH&S) Guidelines for working outdoors in cold temperatures (on the following page).

Here are some tips for preventing strains on your body:

- Try to stay loose and limber, move things steadily and easily and pay attention to what you are doing. Have you ever noticed how much more often you bang and scrape your hands in the winter? That's because the cold diminishes feeling and control in your hands and fingers.





Occupational Health and Safety (OH&S) Guidelines for Working Outdoors In Cold Temperatures

Sunny Sky Air Temp. - °C		26°-28°	29°-31°	32°-34°	35°-37°	38°-39°	40°-42°	43° and below
No Wind	Max. Work Period	Normal Breaks	Normal Breaks	75 min.	55 min.	40 min.	30 min.	NON Emergency work should STOP
	Number of Breaks	1	1	2	3	4	5	
Wind 8km/h	Max. Work Period	Normal Breaks	75 min.	55 min.	40 min.	30 min.	NON Emergency work should STOP	
	Number of Breaks	1	2	3	4	5		
Wind 16km/h	Max. Work Period	75 min.	55 min.	40 min.	30 min.	NON Emergenc work should STOP		
	Number of Breaks	2	3	4	5			
Wind 24km/h	Max. Work Period	55 min.	40 min.	30 min.	NON Emergency work should STOP			
	Number of Breaks	3	4	5				
Wind 32km/h	Max. Work Period	40 min.	30 min.	NON Emergency work should STOP				
	Number of Breaks	4	5					

These guidelines were supplied by Saskatchewan Labour/Occupational Health and Safety Branch. This chart applies to any 4 hour period. Warm-up breaks are assumed to provide 10 minutes in a warm environment.





Equipment:

Circle Checks

Before leaving the depot for your day of making and maintaining the ice, you will perform a circle check on all your equipment. Typically, Ice Maintenance Workers use a daily logbook for any vehicle that they “ride in” or “ride on”. Before leaving the depot at the beginning of your shift you are required to complete the circle check provided in the Operators Daily Log book.

Maintenance Checks

From your experience you understand the importance of maintaining your equipment. You will recall from your equipment training what to look for when performing your maintenance checks on specific pieces of equipment. If you find that a piece of equipment is damaged or in need of regular maintenance, let your supervisor know and it can be booked in for maintenance.





Outdoor Ice Rinks

Preparing an Area for an Outdoor Ice Rink

The first step in building an ice rink is to prepare the area. You do this by removing any natural or artificial obstructions such as weeds, lumps, stones, litter, debris, etc. Then, using a York rake, which is an attachment that's hooked up to a tractor and has many rounded tines that spin, you will grade or level the ground evenly across the area that's soon to be an ice rink. If the rink is boarded, hand raking is done along the inside perimeter of the boards because you should not be any closer than 1' to the boards with the York rake.

Connecting and Adjusting the Length of the Hose

Now you are ready to begin flooding, we just need to get you hooked up to a water source. The blade-truck operator backs up the vehicle (around 6 - 8 meters) to the standpipe or hydrant.

As a crew member stands on the end of the water hose, the blade truck operator slowly drives into the rink through the double doors and to the far end of the rink, allowing the hose to unreel by itself and sit along the ground.





Connecting and Adjusting the Length of the Hose Continued...

Once the blade truck operator is at the end of the rink, the other crewmember connects the hose to the stand-pipe or hydrant.

Since the size of every ice surface varies, the length of the water hose is adjustable. A water hose is made up of sections connected by couplings that can be unfastened. Once you have the water hose unreeled to the desired length (approximately 20 feet from the end of the ice rink), disconnect the hose from the reel at the next coupling.



Before you unscrew a coupling, tap it with a wrench to break any ice that may have formed inside.

Building the Base Ice for Outdoor Ice Rinks

When you're building the base layers of ice, the key is not to pour too much water too quickly on one spot or you'll disperse the aggregate that is used as the base for the rink area, resulting in a hole. Instead, create a layer of smooth ice by dispersing the water evenly.

Starting 20 feet away from the end of the rink, the flooder evenly applies water from side to side, covering the entire width of the area and gradually moving backwards.





Building the Base Ice for Outdoor Ice Rinks Continued...



While one worker floods, the other stays about 20 feet behind them, dragging the water hose back so as to allow the flooder room to move backwards freely. When the hose handler reaches the end of the rink, they exit the rink surface and proceed to pull the slack of the hose outside the rink so that the flooder won't trip over it.

You will flood a layer of water between 1/16" and 1/4" in thickness. Once the layer is frozen, the flooding procedure is repeated until you have an ice surface approximately 3" thick.

Flooding Tips for Outdoor Ice Rinks

- At unboarded rinks you will need to build up a ridge of snow approximately 2" high around the perimeter with the blade truck to contain the water.
- Applying water evenly is the key to achieving a smooth and level ice surface. Apply a coat of water anywhere between 1/16" and 1/4" thick.
- On extremely cold days, the water may form air pockets and create a popping sound as it freezes. When this begins to happen, apply a little less water than usual.
- Avoid getting water on the rink boards; this could cause damage to the wood after it freezes.
- If there is a large crack in the ground's surface when you are starting to flood, fill it with snow and lightly freeze over the top with water.





Reeling the Water Hose



Once the flooding phase is complete, it's time to reel in the hose. Disconnect the hose from the standpipe and reconnect the coupling to the hose on the reel. While one crew member guides



the hose, winding the coils evenly and neatly around the reel, the other slowly turns the crank. It's important to crank the reel slowly, so that you allow as much water as possible to drain out of the hose. Any water left in the hose will freeze and may cause blockage.

Ice Shacks and Rink Gates

Designated people from the community associations are responsible for the day to day unlocking and locking up of the shacks. Being a crew member on the maintenance team also provides you with access to the shacks. You always turn on the rink lights during dark hours. The light switch is located inside every shack. It is set on a timer that you can override by opening the timer box and pulling the lever down to the MANUAL position and pushing the plunger on the outside of the shelter. One handy thing you may have learned is that after unlocking the rink gate, you attach the lock to the gate door and lock it; this prevents anyone from stealing the lock while you're working.





Ice Shacks and Rink Gates Continued...

If you and your maintenance crew are the last to leave a rink site, you are responsible for turning the rink lights back to AUTO so the automatic timer is set, locking the shack and then locking the rink gate.

Maintenance crews are also responsible for keeping shacks clean and tidy, reporting any vandalism, picking up noticeable litter, and maintaining hockey nets and any other on-site equipment.

Maintaining the Outdoor Ice Rink



Regular cleaning and flooding of the enclosed ice maintains the rink. Actually, you have already learned about the flooding procedures. It's the same procedure as we just covered. However, before an ice rink is flooded, it must be cleaned with a blade truck and shoveled.

You may have learned that the snow left in the cracks is actually beneficial in that it acts as a sealant and helps form a smooth surface.





Cleaning Procedures for Outdoor Ice Rinks

Here are the steps you always follow when cleaning ice rinks:

Shoveling Around the Boards



The crew shovels around the edge of the boards of half the rink lengthwise, cleaning at least a 1' wide path along the sides and a 3' wide path around the corners (since they're more difficult to reach with the truck blade). For heavy snow (1" high or greater) you either use a walk-behind or riding snow blower around the boards.

Tips For Cleaning

- Never use a snow blower when anyone, especially children, are in the vicinity just in case the blower picks up and propels an object.
- Always work with the wind. Sometimes this may mean blowing the snow into the centre of the rink to avoid blowing it into a strong wind and having the snow blow back onto the rink.
- Always direct snow over the boards, not at the boards. You want the snow to land outside the rink.





Cleaning the Ice Surface

Once half the rink has been shoveled around the boards lengthwise, either you or



another crew member can begin to clean that section using the blade truck. You call this process “blading” when you move forward and “backblading” when you move in reverse. Remember to turn on the beacon light when the blade truck is on the ice or is pushing snow out of the rink.

Here are some important rules to follow when blading a boarded rink:

- Back blade an area just a bit longer than your truck at one end of the rink so that you are not continually driving over and packing the snow down.
- Always position your blade at an angle so that it pushes the snow in the direction where you want it to go.
- Always ensure that the truck blade is no closer than 6 inches from the boards.
- Gather the snow into a mound aligned with the gate so that the snow can be easily pushed out.





Piling the Snow Outside the Ice Rink



Once the blade-truck operator has cleaned half the rink, the mound is ready to be pushed and piled outside the rink. Raise the blade about 1" over the gates' kick plate before pushing the snow out of the rink. Be careful to pile the snow a distance away from the ice surface so that it won't obstruct a maintenance crew's access to the ice.

Repeating the same cleaning process on the remaining surface area can now clean the remaining half of the ice surface. The excess snow that may have been missed by the blade-truck is cleaned up with the shovel.



If there is a lot of snow, sometimes a large snow blower may come to blow the snow over the boards. In this case, pile all the snow at one end of the rink for the snow blower to remove.





When to Flood



Once it's cleaned, the ice surface is ready for flooding. From your training and experience, you should know that the ideal temperature for flooding is anywhere between -4 and -20 degrees. You know that you're not to flood an ice surface when temperatures fall below -25 degrees, especially when there is a wind-chill factor; the water is likely to freeze too quickly

and crack. On the other hand, flooding an ice surface when temperatures are too warm also results in cracking and heaving in the ice when temperatures fall again. Frequent flooding is the best way to prevent and treat cracks.

- Never flood if it is snowing or blowing, otherwise the falling or drifting snow will stick to the ice and form bumps.
- Monitor the ice surface for cracks that may cause injury to skaters.





Safety Rules When Operating the Blade Truck

Here are some important safety rules to follow when operating a blade truck:

- Check to make sure the pivot point for your blade is tight, it tends to loosen after long-term use.
- When travelling, always make sure the truck blade is straight and in a raised position. Truck blades are controlled by either a toggle switch or hand control equipped inside the trucks.
- When driving, always make sure that the toggle switch or hand control is switched to OFF so the blade cannot accidentally drop.
- Whenever the truck is parked on the ice, it's important that you keep the blade down to prevent it from accidentally dropping on someone.
- Always drive carefully. When you're driving in reverse on an ice surface, constantly check your side and rear view mirrors for people.
- Always make sure you know where your fellow workers are on the ice.
- On school grounds, maintenance crews are allowed to flood the ice while kids are on recess, but if they come near the ice, you must kindly ask them to leave the area.
- Should anyone step onto the ice while you are flooding, immediately stop what you are doing and don't continue to flood the rink until they have left the area.
- Make sure no one steps onto the ice surface while the ice surface is still wet, otherwise ridges will form on the ice.





The Speed Oval

The major difference between speed oval maintenance and other outdoor ice maintenance is the standard of ice quality. The oval track is especially smooth and requires higher maintenance than the other outdoor rinks. Every fraction of a second is crucial to speed skaters' time-run results as well as their safety.



The oval ice track is exceptionally smoother than other outdoor surfaces because it receives:

- a more intensive cleaning process
- a gentler, more even flooding technique
- higher-temperature flooding water

Preparing the Area for the Speed Oval Rink

Each year, before you can prepare the ice for the speed oval you will remove any natural or artificial obstructions from the area. Just as you did with the area you were preparing at the hockey rink, remove weeds, lumps, stones, litter and other debris. Surveyors then map out the area and show any high or low sections that are later evened out by a grader. Once the track is level the York rake is driven over the track and with its many rounded tines provides the final, smooth finish.





Building Base Ice for the Speed Oval

Just as you learned when you were preparing the base ice for the outdoor hockey rinks, the key is not to pour too much water; otherwise you will disperse the crusher dust and dig a hole, instead of creating a layer of smooth ice.

You will flood with a layer of water $\frac{1}{16}$ " – $\frac{1}{4}$ " in thickness. Once the layer is frozen the flooding procedure is repeated until you have a layer of ice approximately 1" – 2" in thickness.

Once the base ice is established on the speed oval, you use the water truck to open flood the track with cold water. Once the ice is 3" – 3 $\frac{1}{2}$ " thick, use the flooding procedure to give the ice a smooth finish.



Filling the Truck's Water Tank

- When you're filling the truck's water tank, one important trick is to open and close the valve on the hot water heater slowly, otherwise you'll cause a surge of water that could potentially rupture water connections.
- Since the hot water heater in the building is not large enough to fill up the water truck, get into the habit of filling the water truck half-full first thing in the morning. This routine gives the hot water heater enough time to heat more water, while you clean and sweep the oval speed track.
- When you've completed cleaning and sweeping the track, you finish filling up the water truck.
- Once the water truck has been filled, you drain and remove your hose so that the water doesn't freeze inside and create any blockages. When you are doing this remember to stand clear of the water draining out because it will be scalding hot!



Fill Hose

Flood Bar Hose



Flooding the Speed Oval

The standards of ice quality for the speed oval track are higher than those for other outdoor ice rinks. The speed oval is flooded using hot water as opposed to cold. The water truck is used and it disperses hot water through a flood bar. The hot water melts any imperfections on the surface. The water in the water heater is



kept at an average temperature of 140°F / 60°C. The water in the flooding truck's water tank should not fall below 90°F / 32°C.


To begin flooding, you drive your water truck on the oval just off the edge of the ice. Next, you attach a flooding burlap mat to the bar that dispenses water. The mat allows the water to be applied more evenly, which gives the ice a smooth texture.





Flooding the Speed Oval Continued...

You're now ready to begin flooding! Here are some points to remember when you are flooding the speed oval:

- Open the flood bar valve at the back of the truck.
 - Move quickly, but safely, to the cab of the truck and drive onto the ice to start flooding.
 - Never flood when it is snowing or windy, otherwise the snowdrift or fallen snow will freeze on the wet ice surface and form bumps.
- 
- Alternate your flooding pattern. In other words, if one day you start from the outside of the track, gradually moving towards the inside, do the opposite the next day. Since more water is released when you start to flood, alternating your flooding pattern will ensure that over the long run all sections receive an equal amount of water.
 - When you're driving the water truck around the ice, you want to apply only one layer of water at a time with as little overlap as possible. But keep in mind that some overlapping is better than no overlapping at all.
 - Always drive at high-idle speed.
 - Never stop the truck on the ice while it is flooding, otherwise it will burn into the ice.
 - When flooding is completed, detach the flood mat and hang it on the back of the truck. This will allow the flood mat to drip dry while the truck is being stored inside.





Cleaning Procedures for the Speed Oval

Blading

Always blade the speed oval ice if there's any hard-packed snowdrift or snow accumulation that's 1/2" or greater. If there is less than 1/2" of snow, proceed directly to sweeping and brooming.

At the speed oval, you use a V-blade truck. The V-blade is different from the ones you see on regular blade trucks in that it can either be straight or set to a "V-plow." This V-plow allows you to push heavy snow more easily than a straight blade and it parts the snow with equal pressure on either side of your blade, preventing your truck from being forced to one side.



On mornings that receive about 1" or more of snowfall, use the V-plow to clean the initial row. Experience has taught you that the most effective way to start blading is to open a path 1/3 into the track from the inside. This method allows 2/3 of snow to be piled on the outside of the ice track; piling too much snow on the inside of the track may cause snowdrift formation.





Cleaning Procedures for the Speed Oval Continued...

When you clean the ice, set your blade straight (not in a V) and at an angle so that it pushes the snow in the direction you want it to go. When you start blading, take as much snow as you can on your blade without it spilling over the top or the high side of the blade.



You always remember the following:

- If there's too much snow on the ice, "V" your blade. This method is designed for moving large amounts of snow off the ice.
- Backblading is not recommended for a V-blade truck, because the V-blade isn't designed for this purpose.
- Always try to push the snow at least 1 meter outside the track. If it's difficult to move the snow 1 meter outside the track because the snow bank is too high, use a snowblower to clear a 1-meter wide path around the edge.

Sweeping / Brooming

After the speed oval has been cleaned, you're now ready to sweep / broom it using a Tractor Broom.

This process removes the snow, however slight, left behind by the blade truck. Even on mornings when no snow has fallen on the oval track, sweep it anyway with the Tractor Broom before flooding. This way you remove even the slightest frost.





Cleaning Procedures for the Speed Oval Continued...

Even on days when flooding is not practical, due to snowing or gusty conditions, broom the ice surface at least once to remove the frost. Keep the ice surface smooth so that the wind can blow it clean. Pick any bristles off the oval track that have come off the broom after you've completed sweeping.



If a lot of snow accumulates on your tractor's air intake, brush it off otherwise it will block the flow of air.



The key to effective brooming is to sweep the snow with the wind and not against it otherwise the snow will be blown back onto the ice.

Before flooding the track, walk around it and spot any noticeable cracks that have formed in the ice due to extreme temperature changes. To treat these cracks you make slush by mixing cold water and snow in a pail. Once you've made your slush, fill in the cracks with the slush, packing it with the bottom of your foot and shaving off the excess slush with a scraper.





Frozen Lake Sites

You're not permitted to work on a frozen lake until the ice has been tested for thickness and it meets the guidelines for vehicle travel. If the ice is less than 14" in thickness, it's unsafe for use.

Just like the other ice rinks, the lake must be cleaned with the blade truck and flooded with the water truck using cold water.

Never clean a lake site if there's anyone using it. If just a few people are skating, kindly ask them to leave before cleaning it, or simply move on to the next lake and return later.

The water truck is used to flood the frozen lakes. It's the same water truck that you use when flooding the speed oval rink. The only difference is that you don't need to use the flood mat and the water tank is filled with cold water instead of hot. This is considered recreational ice, so we are not as fussy as we are with the speed oval rink.





Safety Tips for Frozen Lake Sites

- If you ever see signs of melting ice, immediately drive off the lake and report it to your supervisor. These weak spots will then be barricaded, the lake rink will be shut down, and danger signs will be posted.
- Watch out for any melted snow running down from the streets and onto the ice surface, because this might present a safety hazard and melt the ice.
- If you're by yourself while maintaining a frozen lake site, always carry a two-way radio with you at all times, just in case of an emergency. You've learned how important it is to always let your supervisor know when you are about to go to maintain a lake rink.



At the End of the Day

At the end of the day, all your hard work pays off when you see the public enjoying what you've helped create and maintain – ice rinks. Even though you don't play for a professional hockey team, you are a very important member of a different team – a maintenance team who makes a difference in the lives of many families.



Skating and playing hockey is a prized tradition in this country and you're one of the people who help keep this tradition alive. The public thinks you build ice, but you know that what you're really building are memories and dreams.





Ice Making and Maintenance Outdoor Rinks

Preparing the Area and Connecting the Hose

1. You prepare your area by removing any natural or artificial obstructions from the area such as weeds, lumps of dirt, stones, litter, debris, etc.
2. Then using a Yorkrake you will grade or level the ground evenly across the area soon to be an ice rink. If the rink is boarded, hand raking is done along the inside perimeter of the boards. Don't get any closer than 1' to the boards with the Yorkrake.
3. The blade-truck operator backs up the vehicle approximately 6 - 8 meters away from the standpipe or hydrant.
4. As a crew member stands on the end of the water hose, the blade truck operator slowly drives into the rink through the double door and to the far end of the rink, allowing the hose to unreel by itself and sit along the ground.
5. Once the blade truck operator is at the end of the rink, the other crew member connects the hose to the standpipe or hydrant.
6. A water hose is made up of sections connected by couplings that can be unfastened. Once you have the water hose unreeled to the desired length (approximately 20 feet from the end of the ice rink), disconnect the hose from the reel at the next coupling.



Building the Base

1. When you're building the base layers of ice, the key is not to pour too much water too quickly on one spot or you'll disperse the aggregate that is used as the base for the rink area and make a hole. Instead, create a layer of smooth ice by dispersing the water evenly.
2. Starting 20 feet away from the end of the rink, the flooder evenly applies water from side to side, covering the entire width of the area and gradually moving backwards.
3. While one worker floods, the other stays about 20 feet behind them, dragging the water hose back to allow the flooder room to move backwards freely.
4. When the hose handler reaches the end of the rink, they exit the rink surface and proceed to pull the slack of the hose outside the rink so that the flooder won't trip over it.
5. You will flood a layer of water between 1/16" and 1/4" in thickness. Once the layer is frozen, the flooding procedure is repeated until you have an ice surface approximately 3" thick.





Ice Making and Maintenance Outdoor Rinks

Flooding Tips

1. The ideal temperature for flooding is anywhere between – 4 and – 20 degrees Celsius. You know that you're not to flood an ice surface when temperatures fall below – 25 degrees Celsius, especially when there is a wind-chill factor. The water is likely to freeze too quickly and crack. On the other hand, flooding an ice surface when temperatures are too warm also results in cracking and heaving in the ice after temperatures fall again.
2. Frequent flooding is the best way to prevent and treat cracks.
3. Never flood if it is snowing or blowing, otherwise the falling or drifting snow will stick to the ice and form bumps.
4. Monitor the ice surface for cracks that could cause injury to skaters.
5. At unboarded rinks you will need to build up a ridge of snow approximately 2" high around the perimeter with the blade truck to contain the water.
6. Applying water evenly is the key to achieving a smooth and level ice surface. Apply a coat of water anywhere between 1/16" and 1/4" thick.
7. On extremely cold days, the water may form air pockets and create a popping sound as it freezes. When this begins to happen, apply a little less water than usual.
8. Avoid getting water on the rink boards as this could cause damage to the wood after it freezes.
9. If there is a large crack in the grounds surface when you are starting to flood, fill it with snow and lightly freeze over the top with water.





Ice Making and Maintenance Outdoor Rinks

Safety Tips When Operating the Blade Truck

1. Check to make sure the pivot point for your blade is tight as it tends to loosen after long-term use.
2. When traveling, always make sure the truck blade is straight and in a raised position. Truck blades are controlled by either a toggle switch or hand control equipped inside the trucks.
3. When driving, always make sure that the toggle switch or hand control is switched to OFF so the blade cannot accidentally drop while driving.
4. Whenever the truck is parked on the ice, it's important that you keep the blade down to prevent it from accidentally dropping on someone.
5. Always drive carefully. When you're driving in reverse on an ice surface, constantly check your side and rear view mirrors for people.
6. Always make sure you know where your fellow workers are on the ice.
7. Should anyone step onto the ice while you are flooding, immediately stop what you are doing. Don't continue to flood the rink until they have left the area.
8. Make sure no one steps onto the ice surface while the ice surface is still wet, otherwise ridges will form on the ice.





Ice Making and Maintenance Outdoor Rinks

Cleaning Procedures for the Ice

1. The crew shovels around the edge of the boards along half the rink lengthwise, cleaning at least a 1' wide path along the sides and a 3' wide path around the corners (since they're more difficult to reach with the truck blade).
2. For heavy snow, 1" high or greater, you either use a walk-behind or riding snow blower around the boards.
3. Once half the rink has been shoveled around the boards (lengthwise) either you or another crew member can begin to clean that section using the blade truck. You call this process "blading" when you move forward and "backblading" when you move in reverse.
4. Remember to turn on the beacon light when the blade truck is on the ice or is pushing snow out of the rink.



Here are some important rules to follow when blading a boarded rink:

- At one end of the rink, back blade an area just a bit longer than your truck so that you are not continually driving over and packing the snow down.
- Always position your blade at an angle so that it pushes the snow in the direction where you want it to go.
- Always ensure that the truck blade is no closer than 6 inches from the boards.
- Gather the snow into a mound aligned with the gate so that the snow can be easily pushed out.





Ice Making and Maintenance Outdoor Rinks

Piling the Snow Outside the Ice Rink



1. Once the blade-truck operator has cleaned half the rink, the mound is ready to be pushed and piled outside the rink.
2. Raise the blade about 1" over the gate's kick-plate before pushing the snow out of the rink.
3. Be careful to pile the snow a distance away from the ice surface so that it won't obstruct a maintenance crew's access to the ice.
4. Repeating the same cleaning process on the remaining surface area can now clean the remaining half of the ice surface.
5. The excess snow that may have been missed by the blade-truck is cleaned up with the shovel.
6. If there is a lot of snow, sometimes a large snowblower may come to blow the snow over the boards. In this case, pile all the snow at one end of the rink for the snowblower to remove.





Ice Making and Maintenance Speed Oval

Preparing the Area

1. Before you can prepare the ice for the speed oval you will remove any natural or artificial obstructions from the area, such as weeds, lumps of dirt, stones, litter, debris.
2. Surveyors then map out the area and show any high or low sections that are later evened out by a grader.
3. Once the track is level, the York rake is driven over the track with its many rounded tines, for the final smooth finish.

Building Base Ice for the Speed Oval

1. Just as you learned when you were preparing the base ice for the outdoor hockey rinks, the key is not to pour too much water in one particular spot; you will disperse the crushed dust and dig a hole, instead of creating a layer of smooth ice.
2. You will flood with a layer of water $1/16'' - 1/4''$ in thickness.
3. Once the layer is frozen, the flooding procedure is repeated until you have a layer of ice approximately $1'' - 2''$ in thickness.
4. Once the base ice is established on the speed oval, you use a water truck to open flood the track with cold water.
5. Once the ice is $3'' - 3\frac{1}{2}''$ thick, use the flooding procedure to give the ice a smooth finish.



Filling the Truck's Water Tank

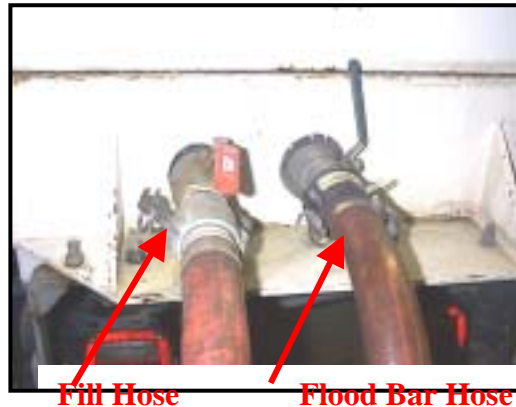
1. When you're filling the truck's water tank, one important is to open and close the valve on the hot water heater slowly, otherwise you'll cause a surge of water that could potentially rupture water connections.
2. The hot water heater in the building is not large enough to fill up the water truck with one fill. Get into the habit of filling the water truck half full first thing in the morning. This routine gives the hot water heater enough time to heat more water while you clean and sweep the oval speed track.
3. When you've completed cleaning and sweeping the track, finish filling up the water truck.





Ice Making and Maintenance Speed Oval

4. Once the water truck has been filled, you drain and remove your hose so that the water doesn't freeze inside and create blockage. When you are doing this remember to stand clear of the water draining out because it will be scalding hot.



Flooding Procedure

The water truck is used to flood the oval. It disperses hot water through a flood bar and the hot water melts any imperfections on the surface. The water in the water heater is kept at an average temperature of 140°F / 60°C. The water in the flooding truck's water tank should not fall below 90°F / 32°C.



1. Drive your water truck on the oval just off the edge of the ice and attach the flooding mat to the bar that dispenses water. The mat allows the water to be applied more evenly, giving the ice a smooth texture.
2. Open flood bar valve at the back of the truck.



3. Move quickly but safely to the cab of the truck and drive onto the ice to start flooding. Remember to never flood when it is snowing or windy, otherwise the snowdrift or fallen snow will freeze on the wet ice surface and form bumps.

4. Alternate your flooding pattern. In other words, if one day you start from the outside of the track, gradually moving towards the inside, do the opposite the next day. Because more water is released when you start to flood, alternating your flooding pattern ensures that over the long run all sections receive an equal amount of water.
5. When you're driving the water truck around the ice, you want to apply only one layer of water at a time with as little overlap as possible. But keep in mind that some overlapping is better than no overlapping at all.





Ice Making and Maintenance Speed Oval

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6. Always drive at high-idle speed and never stop the truck on the ice while it is flooding, otherwise it will burn into the ice.
7. When flooding is completed, remove the flood mat and hang it on the back of the truck. This will allow the flood mat to drip dry while the truck is being stored inside.

Cleaning Procedure

Blading

1. You always blade the speed oval if there's any hard-packed snowdrift or snow accumulation that's 1/2" or greater on the ice. If there is less than 1/2" of snow, proceed directly to sweeping and brooming.
2. On mornings that receive about 1" or more of snowfall, you will use the V-plow to clean the initial row. Experience has taught you that the most effective way to start blading is to open a path 1/3 into the track from the inside. This method allows 2/3 of snow to be piled on the outside of the ice track.
3. When you clean the ice, you set your blade straight (not in a V) and at an angle, so that it pushes the snow in the direction where you want it to go. When you start blading, take as much snow as you can on your blade without it spilling over the top or the high side of the blade.



You always remember the following:

- If there's too much snow on the ice, "V" your blade, this method is designed for moving large amounts of snow off the ice.
- Backblading is not recommended for a V-blade truck, because the V-blade isn't designed for this purpose.
- You always try to push the snow at least 1 meter outside the track. If it's difficult to move the snow 1 meter outside the track because the snow bank is too high, use a snowblower to clear a 1-meter wide path around the edge.



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Ice Making and Maintenance Speed Oval

Sweeping / Brooming

Even on mornings when no snow has fallen on the oval track, you like to sweep it anyway with the tractor broom before flooding. This way you remove even the slightest frost.

On days when flooding is not practical, due to snowing or gusty conditions; you broom the ice surface at least once to remove the frost. Keep the ice surface smooth so that it can blow clean with the wind. Remember to pick any bristles off the oval track that have come off the broom after you've completed sweeping.



1. After the speed oval has been cleaned, you're now ready to sweep / broom it using a tractor broom. This process removes the snow left behind by the blade truck.
2. If a lot of snow accumulates on your tractor's air intake, brush it off, otherwise it will block the flow of air.
3. The key to effective brooming is to sweep the snow with the wind and not against it otherwise the snow will be blown back onto the ice.

4. Before flooding the track, walk around the track and spot any noticeable cracks that have formed in the ice due to extreme temperature change. To treat these cracks you make slush, mixing cold water and snow in a pail. Once you've made your slush, you fill in the cracks with the slush, packing it with the bottom of your foot and shaving off the excess slush with a scraper.





Ice Making and Maintenance Frozen Lake

You are not permitted to work on a frozen lake until the ice has been tested for thickness and meets the guidelines for vehicle travel. If the ice is less than 14" in thickness, it's unsafe for use.

Just like the other ice rinks, the lake must be cleaned with the blade truck and flooded with the water truck using cold water.

You never clean a lake site if there are lots of people using it. If just a few people are skating, kindly ask them to leave before cleaning it, or simply move on to the next lake and return later.

The water truck is used to flood the frozen lakes. It's the same water truck that you use when flooding the speed oval rink. The only difference is that you don't need to use the flood mat and the water tank is filled with cold water instead of hot.



Safety Tips for Frozen Lake Sites

- If you ever see signs of melting ice, immediately drive off the lake and report it to your supervisor. These weak spots will then be barricaded, the lake rink will be shut down, and danger signs will be posted.
- Watch out for any melted snow running down from the streets and onto the ice surface, because this might present a safety hazard and melt the ice.
- Because you're often by yourself while maintaining a frozen lake site, always carry a two-way radio with you at all times, just in case of an emergency. You've learned how important it is to always let your supervisor know when you are about to go maintain a lake rink.



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