Olympic Ice Making

The Vancouver 2010 Olympic and Paralympic Winter Games will see the world's best winter athletes compete on the coolest fields of play: ice. Making great competition ice is not an easy task. It requires the world's top ice makers, known as ice meisters, as well as state-of-the-art ice making equipment and a dedicated team of specialists whose job is to maintain perfect surfaces for figure skaters, speed skaters, short track speed skaters, curlers, wheelchair curlers, sliders, ice hockey and ice sledge hockey players.

Short Track Speed Skating and Figure Skating

Venue: Pacific Coliseum

The ice:

Ice thickness varies slightly between figure skating and short track speed skating. Thicker (approximately 4.5 to 5 centimetres) and softer ice is needed for figure skating, while slightly thinner (3.5 to 4.5 centimetres) and firmer ice is required for short track speed skating.

The ideal temperature for short track speed skating ice is –5.5° C and –3° C for figure skating.

Figure skating ice is the softest of all Olympic ice surfaces, helping skaters dig in for jumps and spins.

To transition the ice surface from short track speed skating to figure skating, more layers of ice will be added after short track competitions using the ice resurfacer. After figure skating competitions end, the ice will be shaved down and temperatures adjusted.

During maintenance, the ice resurfacing machine floods the ice with hot water and shaves the ice surface with a blade slightly longer than two metres. For figure skating, ice patchers skate onto the rink to fill holes in the ice with slush prior to resurfacing.

In addition to the ice resurfacer, short track speed skating stewards will flood the ice with buckets of domestic, or room temperature, water and then use a squeegee to smooth over the surface to fill in any ruts or grooves between races.

Emergency repairs are made using water and a fire extinguisher. Water and slush or snow is packed into large ruts or grooves,

smoothed with a trowel and then sprayed with a pressurized carbon dioxide canister to freeze the repair instantly.

Ice is made in approximately five days:

- The cooling system is turned on and a saline solution (known as the brine) flows through a series of pipes that are embedded in the concrete slab where the ice will sit and cools it.
- A thick rope is laid in place where the edges of the ice will be to contain the water that will be sprayed.
- When the concrete is cooled, ice makers spray thin layers of water over the surface and freeze them. After the first three layers, a layer of paint is sprayed and sealed. After a few more layers are sprayed and frozen, logos and lines are painted on the ice and sealed.

After more than 20 thin layers of ice, ice makers begin to use the Olympia ice resurfacer to smooth the surface and trim it until it is the correct thickness.

Speed Skating

Venue: Richmond Olympic Oval

The ice:

Speed skating ice is approximately 2.5 to 3 centimetres thick and the 400-metre track is 13 metres wide.

The ideal temperature for speed skating ice is −5° C to −9° C.

During maintenance, the ice resurfacing machine floods the ice with hot water (65° C) and shaves the surface with a blade slightly longer than two metres.

Speed skating ice is harder than short track speed skating ice because there are more straightaways, requiring more speed and less grip.

Emergency repairs are made using slush and a pressurized carbon dioxide canister to freeze and repair large ruts or grooves.

To install ice in the Richmond Olympic Oval takes approximately 14 days:

- The cooling system is turned on and a saline solution (known as the brine) flows through a series of pipes that are embedded in the concrete slab where the ice will sit and cools it..
- A 2.5-centimetre rope is laid in place where the edges of the ice will be to contain the water that is sprayed.
- When the concrete is cooled, ice makers begin to spray thin layers of demineralised, filtered water.
- After the first layer is frozen, a layer of paint is sprayed and sealed. After three or four layers are sprayed and frozen, logos and lines are painted on the ice and sealed.
- After more than 20 thin layers are created, ice makers begin to use the Olympia ice resurfacer to smooth the surface and trim it to the correct thickness.

Ice Hockey and Sledge Hockey

Venue: Canada Hockey Place and UBC Thunderbird Arena

The ice:

Hockey ice is approximately 2.5 to 3 centimetres thick, and its ideal temperature is −5° C to −7° C at Canada Hockey Place and −6° C to −7.5° C at UBC Thunderbird Arena.

Hockey ice is slightly harder than figure skating ice to withstand impact but still soft enough for agile stops and turns.

In between the 20-minute ice hockey periods, two ice resurfacing machines simultaneously flood the ice with hot water and shave the ice surface with a blade slightly longer than two metres, taking approximately eight minutes to do the job.

For the first time in Paralympic Winter Games history, ice surfaces will be made in the players' benches area and penalty boxes to ease the transition for players from resting area to playing surface.

Hockey ice is made in approximately three to four days:

- The cooling system is turned on and a saline solution (known as the brine) flows through a series of pipes that are embedded in the concrete slab where the ice will sit and cools it.
- When the concrete is cooled, ice makers begin to spray thin layers of treated water, freezing each layer before adding another.
- After the first six to eight layers of water are frozen, a layer of white paint, logos and lines are sprayed and sealed with a fine mist of water which freezes instantly.
- After more than 30 thin layers of ice are frozen, ice makers begin to use the Olympia ice resurfacer to flood the surface until the desired thickness is achieved.

Curling and Wheelchair Curling

Venue: Vancouver Olympic/Paralympic Centre

The ice:

Curling ice is approximately 3 centimetres thick and is not a smooth surface, but pebbled with bumps of ice.

The ideal temperature for curling ice is between –3° C and –7° C.

Ice sheets are maintained with hand-held ice scrapers and re-pebbled by spraying water from a backpack using a special hose head to control the size of droplets.

The venue will house four sheets of competition ice. Each sheet is 45.72 metres by 5 metres.

Making Olympic curling ice takes approximately 10 days:

- The cooling system is turned on and a saline solution (known as the brine) flows through a series of pipes that are embedded in the concrete slab where the ice will sit and cools it.
- When the concrete is cooled, ice makers begin to spray thin layers of demineralized water on the slab which freezes.
- After the first few layers are frozen, a layer of paint is sprayed and sealed. After 10 to 12 layers are sprayed and frozen, logos, lines and the "house" are painted on the ice and sealed.
- Plywood, insulation and carpet are laid on top of the ice to divide the sheets of ice and provide a walkway between them.
- After the walkways are in place, ice makers begin to pebble the ice, spraying water from a backpack. Several layers of pebbled ice are sprayed.

Bobsleigh, Luge and Skeleton

Venue: The Whistler Sliding Centre

The ice:

Sliding track ice is on average about 2 to 5 centimetres thick but is always fluctuating along the 1,450-metre-long track and through 16 turns. The Whistler Sliding Centre provides the only outdoor ice surface at the 2010 Winter Games.

A roof covers 75 to 80 per cent of the track and blinds have been installed along the track to be pulled down to protect the ice from sunshine and other weather conditions.

The track surface is a twisting, turning chute of ice that has approximately 80 per cent vertical and 20 per cent vertical-to-horizontal-transition surfaces and accepts forces exceeding 3,150 kilograms and up to 5Gs.

Ice temperature is dependant on atmospheric conditions such as humidity, dew point, air temperature and other weather conditions. However, ice makers try to attain an ice temperature of approximately –5° C, which is ideal for achieving the fastest speeds with the most consistency.

Bobsleigh requires slightly softer ice than skeleton or luge because of the weight and gravitational forces applied to the track.

Before a race starts, crews will shave off any bumps and smooth the surface of the track with scrapers. The entire track will be sprayed with a thin layer of water to ensure there is no frost on it. Between races, crews may "slush" the track, filling in any ruts or grooves with a snow/slush mixture.

Sliding track ice is made in approximately 10 days:

- Ammonia is pumped up Blackcomb Mountain through a system of pipes embedded in the concrete track, cooling the concrete so water will freeze when sprayed on it.
- This direct ammonia refrigeration system is about 100 times more efficient than the cooling brine which is used for most indoor hockey arenas.
- When the concrete track is cooled, ice makers begin to spray thin layers of local mountain water and freeze each layer before adding another.
- Ice is maintained 18 hours a day, seven days a week by hand with a variety of ice scraping and shaping tools such as scrapers, trowels, brooms and shovels

Humidification

When it comes to ice, frost is the enemy of speed and control. Because frost is the result of moisture on ice, keeping humidity levels to approximately 45 per cent at all indoor ice venues is a priority. To achieve this, indoor ice venues have dehumidifiers; fan-like machines that intake and process the humid Vancouver air and pull out moisture.

Ice meisters monitor moisture levels and adjust the output of dehumidifiers according to weather conditions, the number of spectators and other factors that contribute to humidity levels inside the venues.

Ice Meisters and Ice Monitors

Five internationally known ice makers were recruited by the Vancouver Organizing Committee for the 2010 Olympic and Paralympic Winter Games (VANOC) to oversee the ice installation and maintenance processes for the 2010 Winter Games and help train staff and volunteers.

Speed skating: Mark Messer
Short track speed skating and figure skating: Kameron Kiland
Ice hockey: Dan Craig
Curling: Hans Wutherich
Bobsleigh, luge and skeleton: Tracy Seitz

To ensure the ice is in top shape for the 2010 Winter Games, ice meisters can monitor conditions 24/7 with a wireless environmental monitoring system called Eye on the Ice. Monitors detect temperature, humidity, air pressure, brine or ammonia flow, and ice conditions and send reports via e-mail to the ice meisters at regular intervals. The monitors, which are set in the ice and around the venues, can also send out alarms if conditions reach unacceptable levels. This stream of information allows the ice maker to manipulate the venue conditions and optimize the ice surface.