WORLD CURLING FEDERATION

Building a Modern Curling Facility

THE BUILDING

The sheets should be a maximum 4.75 metres wide (15 feet 7 inches) and 45.72 metres (150 feet) long to conform to the World Curling Federation rule book.

Walkways around the ice-surface should be at least one (1) metre (3 feet) wide. At the home end having it wider, if possible, is suggested. This is recommended to keep dirt off of the ice surface and to avoid air movement down the walls towards the ice surface due to cold walls.

The height between the ice and the ceiling should be enough to prevent the cooling of the ceiling. This can lead to a build-up of condensation and possible dripping onto the ice surface. Six (6) metres (20 feet) is the recommendation.

Walls and roof design should be as tight (closed) as possible (see air condition and humidity) and well insulated to prevent any adverse effect from outside weather conditions.

Preferably, a “warm” material such as wood should be used in the ceiling and wall construction as it will not absorb the cold allowing for higher humidity levels before the condensation point is reached. Again, this will prevent dripping onto the ice surface. A dehumidifier can help with that problem too.

There should be room in the ice area to park a power scraper on or close to the ice. The scraper must be parked in a cold area. If it’s possible the blade should rest on cold carpet. It’s good if there is room to maintain (change or hone) the blade in the front of the machine.

To take care of snow from the scraper, a snow-well is recommended and this can also be used as a well to take the water out after season.

THE BUILDING

A workshop room and a water room should be located in the building. The workshop room is used to maintain and repair equipment and for storage of tools. The pebble water heater and pebbling equipment should be located in the water room together with the flooding hoses and a tap for both hot and cold water to mix for flooding. This room should have space for water treatment equipment, either Deionising (DI) or Reversed Osmosis (RO). These rooms must be located close to the ice surface.

It's preferable to have the ice surface free from stones when ice maintenance is performed. A cold area with stone boxes dedicated for the stones outside the maintenance area is a solution but can pose a challenge.

In cold areas where frost can go deep into the ground, the building has to be insulated to prevent heaving from the outside.

THE PLANT

For a single curling rink, it is a good idea to use two or more compressors and two brine pumps. Frequency steered compressors will save energy and will allow for the brine to last longer.

It is recommended that the plant should have a full heat recovery function.

Use compressors with primary refrigerants which are environmentally friendly and abide by the local rules governing their use.

Insulate all plants rooms carefully or locate them away from any public rooms to avoid noise pollution.

THE ICE BASE

The ice surface base should be constructed of concrete (insulation with extruded Styrofoam will prevent frost underneath). A frost barrier or heating mat (heated by a heat recovery system from the ice plant) should be installed beneath the cooling floor to allow for longer seasons. A frost barrier is not possible to install afterwards. Other types of floors (on pillars, second floor and so on) are possible with the proper design.

The level of the cooling pipes is the most important part for a concrete floor of good quality and requires a variation of less than +/- 2 mm. The concrete surface should be as flat as possible and form as thin a layer between the pipes and ice to help keep a consistent thickness of ice across the whole surface.

The pipes (polyethylene, PVC) should be of a dimension for good flow allowing easy heat removal. The pipe diameter should be 25 mm (1 inch) with 75 mm (3 inches) or less between the centres. It is also possible to use 20 mm (3/4 inch) pipes with 60 mm (2.36 inches) between centres.

The pipes should be located across the rink (if an “ice-mat” or ice grid system with smaller bore pipes is to be used, the mat or ice grid pipes can be down the rink) to prevent frost ridges (washboard) along the sheets. Large difference between ingoing and outgoing brine-temperature will give uneven frost ridges.

With regard to energy efficiency, Calcium Chloride is a good choice of secondary coolant. Its heat transfer coefficient is better than glycol. Both are environmentally acceptable.

A “three header” system is recommended as it will give a more even temperature on distributed brine liquid and because of that more even temperature over the whole surface. The cooling pipes should only do one turn from in to out to keep the difference (deltaT) in brine temperature as low as possible. The pipes, pumps

THE ICE BASE

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The floor has to be reinforced and the top of the cooling pipes should be covered by 25 mm (1 inch) concrete. It is advisable to lay a reinforcement net on top of the pipes as it gives a strengthened floor and also gives better possibilities to lay and keep the cooling pipes in level during the concrete pouring procedure.

The base should be constructed to prevent movement of the floor. If built directly on the ground, the base should not be connected to the rest of the building to prevent movement from the building influencing the base (known as floating floor).

The edge of the concrete floor should have a frame of concrete (10 to 15 mm/0.39 to 0.59 inches high like a pool) to prevent leaks. On the inside of this frame, a wooden lining 12 to 15 cm (4.72 to 5.91 inches) high should be fitted. A loose wood frame is also possible but is liable to leak.

The concrete surface should be smooth to allow painting. The paint has to be of good quality. Take advice from an experienced painting company.

When painting the ice, a high quality environmentally approved (non-toxic with no oil content) ice paint should be used.

Synthetic printed circles and end-to-end solutions are available and eliminate the need to paint.

AIR CONDITION & HUMIDITY

The air in the arena should be heated (see steering and control systems) and controlled by a thermostat. Comfortable and economic air temperature is approximately +7 to +10℃ (+44.6 to +50°F) 1.5 m (5 feet) above the ice.

In areas with high humidity, the humidity inside the arena should be controlled by a dehumidifier. Dehumidifiers need a tight building to work well. The dimensioned dew point-temperature is -4.5℃ (23.9°F) and the economical and appropriate running dew point temperature can be around -2℃ (28.4°F) for ideal playing conditions.

To have good ice-conditions, no constant air movement over any areas of the ice should be allowed. Cold walls can create air movement (cold draught) over the ice and problems with frost freezing along the wall. This can be prevented by walkways around the ice but it is better to have properly insulated and tight walls.

STEERING & CONTROL SYSTEMS

If the curling rink is using the same refrigeration system as a skating rink, the curling rink should have its own brine pumps and its own steering and control system to enable the ice surface temperature to be maintained at the correct stable level.

Using a three-way valve with motor shunt and thermostat-regulated towards the brine is a good solution to maintain a stable temperature. To have stable conditions at the right level in the rink is very important.

The main factors to have control over and to steer are air-temperature 1.5 m (5 feet) over ice, dew point temperature in the ice shed, ice surface temperature, and supply and return temperatures of the brine. There are many points to have control over in the automation system, but every rink will have its' own specific solution.

The refrigeration plant should have a full heat recovery system. The hot water produced should preferably be used in the curling rinks cold area, but of course also for other needs (example: heating the floor underneath the ice base). A heat recycling system has a payback time of less than three years depending on location in the world.

WATER

Clean water is a very important requirement in a curling rink. Both to have an energy efficient and hard ice surface and clean water for the pebble. Two purification systems are used in curling rinks, Deionising (DI) or Reversed Osmosis (RO).

Pebble-water needs to be heated, preferably in a thermostat-regulated tank.

A Reverse Osmosis (RO) system (membrane system) is preferred as it is more environmentally friendly as there is no requirement to take care of chemical substances like there is in a deionising (DI) system. RO used for flooding need a storage tank.

To flood a 4-sheet rink using hot water (approximately 35°C (95°F)), requires a capacity of at least 3 m^3/h at the end of the hose during the time of flooding (approximately 1 hour) and a reheating capability of three (3) hours. Water flow should be controlled by a flow meter capable of delivering the water to the ice at 50 L/min (13.2 gal./min).

LIGHTING

The rink should have good lighting. The lamps should be directed to prevent reflection off the ice that can be distracting for the athletes. A location between the sheets is a good choice but it is recommended to consult with a lighting expert. There should be no heat radiation from the lights.

LED is the preferred choice of lighting. It emits excellent light with no heat radiation while saving energy. The energy savings alone results in a short payback time. A dimmable system is recommended to save even more energy.

Brightness can vary from 750 Lux (minimum) to 1500 Lux (broadcast quality).

ACOUSTICS

Vocal communications (screaming) are an important part of the game. It's suggested to use a sound consultant to check the ice shed and suggest solutions.

Noise absorbing materials play an important role. A reverberation of no more than 1.2 sec is recommended.

COSTS

To have control over the costs the World Curling Federation suggests that you hire a local project leader and an architect that know a lot about curling rinks and can give a robust cost estimation.

As the requirements are so different in a curling rink compared to other ice sports you should use a project leader that has the required knowledge about the needs for curling. Otherwise, you can, from a technical perspective, have a “hockey-rink” solution to curl on when all is finished and that’s not what you are looking for.

EQUIPMENT

This section aims to list all the equipment that can be purchased for the purpose of reference, to enable technicians to consider what they should be buying or making.

Ice technicians are advised to buy their own specialist equipment as a gradual investment in their own profession.

Not all equipment listed is essential. As a guide, items with an asterisk (*) are recommended while items items without may be required depending on the building and the installation type (painted houses vs. printed houses vs. end-to-end solutions).

- Barrel or strong bin, 200 litres, for brine*
- Battery-powered drill/screwdriver & bits*
- Bilge pump, plastic or stainless steel*
- Blowtorch, hand-held with spare gas*
- Circle scribe, router type*
- Cotton lines/yarn/wool for all the lines*
- Cotton mop and bucket for ice*
- Coupling with valve for flooding*
- Couplings*
- Curling stones*
- Water treatment unit*
- Dustpan and brush*
- Flooding cups*
- Flooding hose long enough to flood from both ends*
- Flooding stick with valve *
- Flow meter
- Hacks (Marco)*
- Hand scraper*
- Hand spray can for the lines *
- Honing kit and stones*
- Hose clips*
- Hydrometer*
- Hygrometer*
- Ice paint, red and blue*
- Ice paint, white*

EQUIPMENT

- Ice-surface thermometer (fixed probe)*
- Ice-surface thermometer (hand-held)*
- Laser level or theodolite
- Litmus papers, for testing pH*
- Mats to cover hacks*
- Measure for six-foot circle*
- Measure for houses*
- Measuring jug (for snow after nipping)*
- Measuring tape, long*
- Measuring tape, short *
- Mixer for hot and cold flooding water w/thermometer
- Nipper*
- Oil, rust-inhibiting*
- Paint brushes and/or rollers*
- Paint brushes for the houses (old curling brooms)*
- Paint roller (for logos)*
- Pebble can*
- Pebble heads*
- Pipe, clear plastic, for pumping brine into header tank*
- Power Scraper*
- Power Scraper blades (x2)*
- Racks, for racking/moving stones*
- Scale remover (with jug)
- Snow bin*
- Snow shovel*
- Spray bottle for repairs*
- Spray gun or nozzle for sealing with hose*
- Spraying equipment (boom)*
- Square for line measure*
- Stone-storage locker for the summer
- Stopwatch*
- String mop and spare mop heads*
- Tee centres*
- Thermometer for outside temperature*
- Thermometer for urn water*
- Thermometer probe under the floor*
- Thermometers for brine (in and out)*
- Tool kit*
- Towelling and cloths*
- Urns for pebble water x2*
- Vacuum cleaner, wet & dry*

Items marked with (*) are necessary.