PREPARATION

Any builder or painter will know that careful and thorough preparation is 90% of the job. Here the preparation is towards providing the best foundations and structure for the purpose of providing excellent curling ice for the duration of a season. The hard work is not the day to day routine of plodding up and down ice sheets for eight months or more, the hard work is the preparation of the floor, the walls, the roof, the plant and everything that is required to sustain the function of the curling rink.

1. Sand floors

The surface ice has melted and the sand is now a soggy mess, covered in a sticky residue of paint and dirt. Drying this out needs careful thought, using any means that will contribute. Run the dehumidifiers, trying to keep the relative humidity (RH) below 50%. If the outside RH is lower than inside the rink, open doors to allow airflow through the ice hall for the main part of the day (and remember to close them again!). Heating should not normally be required as the warmer air will simply hold more moisture, and the summer heat from outside will be sufficient.

Many technicians become very skilled at removing the paint and dirt before it reaches the sand, and they will reap the benefits. Some will melt the ice from the top down by keeping some refrigeration running but increasing the heat from above, and once the layer of paint is reached the whole lot can be pushed into a drain or vacuumed into containers for disposal. Now the refrigeration too is switched off and the melting can proceed into the deeper sand. The amount of thawing required to deal with permafrost below the sand will vary from rink to rink, and if a heat mat exists this will make a huge difference – normally it will take at least a month, if not three. By this time the sand will be dry on top and less of a mess to work with.

Mapping the floor with a laser is now essential. In fact, it is better to map the top level of the pipes rather than the sand, because there could be large discrepancies. If the map reveals variations greater than 10mm it is time to take notice, and if the variations are towards 20mm action should be taken to deal with these. If time permits the map should present readings at 1m spacings in all directions, which will take about half a day per sheet – the higher readings will mean lower pipes and vice versa, and if the readings are converted into actual height above the lowest point it is possible to transfer these into an Excel spreadsheet and produce a simple chart that will clearly show the contours. Our advice is to use a laser level rather than a theodolite, the instrument is cheaper and much quicker and simpler, and can easily be used by one person – if the base unit is placed on a table or something at about one meter high and using a long ruler with a small footplate attached, there is less bending and the ruler won't fall off the pipes or sink into the sand.

If it is clear that there are problems, don't panic. Sometimes it is possible to deal with small low areas simply with a little gentle leverage to raise the pipes and their battens or saddles and ensure that sand flows into the void to support them. However, if this does not sort the problem, there is hard work ahead. Remove the sand, find the pipes, repair/replace the battens or saddles and level them, replace the sand, check the levels again. Sorry, this is a pig of a job, and why anyone bothers to do this is beyond me – if this work is deemed necessary, scrap the lot and install a concrete floor with new piping to last for a very long time.

Once the pipes have been levelled they must be covered with a layer of sand to provide a smooth and firm surface some 10mm above the tops of the pipes. This is not too difficult, simply barrow in the sand (using boards as walkways), rake the lumps out and drag a long board across the surface in all directions. Occasional checks with the laser will reveal the highs and lows and within a day the surface will be level. Beware of uneven compaction, because when water is introduced some areas will absorb more and freeze differently to others – the ideal is to have a consistency that is firm enough to walk on, yet still sufficiently porous to allow the first flood to reach the bottoms of the pipes.

The best kind of sand to use is a coarse grit. In Scotland it is common to use whin stone dust, with particles from 4mm down to dust. This is a free-draining material that binds well and remains free-draining (until of course too much paint changes the texture!) and is widely used to lay paving slabs. When firmed and dry it is very hard on the surface, almost like concrete, yet it can still be loosened and worked. It is possible to find whin dust with particles from 2mm down to dust, which is easier to work with and will firm very well without losing its drainage properties. This dust is effectively quarry waste created when large boulders are broken down into various graded sizes and it is not expensive, but it can sometimes be difficult to find because everyone else has bought some!

What is referred to in the building trade as "sharp" sand is also commonly used, because it has much of the same properties, but it is usually finer than whin. Anything finer than this will be unsuitable, and building sand (used for bricks and mortar) will be very difficult to work with.

2. Concrete floors

As soon as the ice has been thawed and the water has drained, the remaining puddles can be mopped up and the preparation can begin. Unlike sand floors a concrete floor is really very easy to work with, partly because it is very much cleaner and partly because there really isn't much anyone can do about variations in level. The one important thing to remember as the water clears is that it pays to wash the entire floor while it is wet, and in the process remove all the dust, dirt and lint of a full season's curling. The simplest is to wear rubber shoes that will keep your feet dry and will not easily mark the paint, then sweep all the water towards the draining area with wide, soft brooms. Then do it all over again, starting in the furthest corner from the drain, and occasionally feed some clean water from a hose to keep the surface flowing. Be sure to mop the puddles before they dry, because once the floor dries all that dirt will stick and will refuse to be removed, even on the edges of the smallest puddles. If the floor is going to be painted for the first time, use some sugar soap or diluted vinegar as cleaning agent in this final clean to ensure that all greasiness or mould is removed.

If there are cracks or problem areas in the floor, these need proper repair. Larger cracks will have to be filled with something that will not be affected by water or ice, using cement for the largest and perhaps sealant for smaller cracks. The reason is that water expands when it freezes – during the initial flooding water will enter the cracks, freeze and expand, and the cracks will simply become larger and larger. If the floor is properly prepared and sealed it will stay that way for many years. Pay particular attention to the sideboards, if there is no concrete wall behind them to "dam" the water on the floor the boards must be sealed where they meet the concrete floor, to prevent water from escaping during the flooding process.

At this stage ensure that the heat mat is fully operational. In modern buildings it could be a system of underfloor heating that is like a large mat of electrical heating coils; in a less modern building it could be a system of heating pipes through which warm water/secondary refrigerant is pumped; in an old building it could be non-existent. Because all this is under concrete and impossible to inspect, ask an electrician to check the supply and usage of an electrical system and a competent pumping engineer to inspect the pumped system. If there is no heat mat, or it isn't working, don't even try to believe it does not matter – if the permafrost under the concrete is not thawed it will destroy the building! As a rough guide, 50mm insulation under the concrete will allow ice to be in place for eight months, leaving four months to guard against permafrost. On the other hand, with thicker insulation or a properly functioning heat mat there will be no problem.

With the floor now clean and dry, it can be fully sealed. To deal with slightly porous areas or small (hairline) cracks, diluted PVA (PVA:Water 1:10 at most) works well – give these areas a careful coat with a brush and ensure that the mixture penetrates the cracks well. Then paint the entire floor with the diluted mixture, either by splashing some and sweeping it out or applying by roller. Splashing the stuff about is messy and might seem quicker, but you'll be walking in it all the time and it really is not that easy. A roller will take longer but will make very little mess. Again, wait until the floor is dry before proceeding to the next stage.

Painting the floor is a big job, and it has to be done properly. We cannot claim to be experts on paint, but what we do know is that the best paints cost the most and may not be necessary. A quality matt emulsion will work well if not applied too thickly (vinyl or silk emulsions are too "oily"), and for the first time at least two coats will be needed. Use wide buckets and rollers such as contractors use, with long handles and fine hairs – the finer the hairs, the less splattering of small drops of paint. Some four five-litre tins will be needed per sheet, per coat for the white floor; first paint the edges with a wide brush, then start at the far end and work backwards, as evenly and systematically as possible, usually one sheet at a time unless there are many competent helpers (who often make more work than they're worth!). Beware, once dry this paint marks very easily and cannot be walked on without proper protection to your feet, which can be clean socks, plastic bags or plastic surgical overshoes – the latter works very well. Remember also that paint cannot dry or cure well under 10ºC, and even then it needs a week or so to cure properly. Expect the whole process of cleaning, sealing and painting to take at least a month.

Of course, once the floor has been properly prepared and painted, the process will be much reduced in following years. After the final clean, simply wait for it to dry, and repainting will only be needed if it hadn't been done properly before. What we have found, though, is that a spotlessly clean floor really does help to keep the ice clean, with the curlers fully appreciating the efforts and helping to keep it looking pristine by keeping themselves clean, while any dirt that does become embedded in the ice surface is easily spotted and removed.

Before the circles can be painted, some accurate measuring will be needed. First measure the total length and width along every side. Down the length, find the exact middle points of the two lengths and mark these with a visible brass screw into the sideboards. From these points then measure the distance to the backlines and mark the backs of the lines (if tapes will be used) with screws at each end and side. From those points measure to the teelines, the hoglines (the distance closest to the teelines) and the footlines, and add the screws for those. All the screws will stay there forever, so get it right first time!

Now divide the width measurements by the number of sheets and mark out the positions for the sidelines with screws – the width will vary from rink to rink, but the modern requirement is for a sheet width of five metres. Between the sidelines, mark the centrelines with screws. With string, find the centres of the circles where the teelines and centrelines cross, and drill a small hole into the concrete in exactly the right place, but only about a centimetre deep – don't drill into pipes here! From the centreholes it is now possible to scribe the edges of the circles at radii of two, four and six foot with a pencil – I use a special piece of light square tubing with a point welded onto one end, a small foot at the other (protected by plastic to not mark the white paint) and holes drilled through for the position of the pencil. The small centre of the circles is usually simply the size of a curling stone's diameter, about six inches radius, which only needs a thin black line (10mm wide is adequate) painted onto the floor. The other circles can be painted any colour, but I believe blue for the outer and red for the inner circles looks best. Use a quality brush for these, one for each colour of white, blue and red, about 10cm wide – the better the brush, the easier to paint the exact edges of the circles. Get it right first time and there will be no need to do it again, except for a little touching up here and there. Note that, if the measuring has been done well, the edges of the six-foot circles will be exactly in line with the backs of the backlines, and that is some achievement!
The dimensions needed for a curling rink are available from various sources, usually also in the rule books or from the World Curling Federation (http://www.worldcurling.org/rules-and-regulations).

3. Painting the ice

As this is really part of the next section, full details can be found in *BUILDING THE ICE PAD*.

4. Cleaning

It would be nice to think that the cleaning of walls, ceilings and all else should be done before the cleaning job on the floor and all that pristine white paint, but it really isn't easy to do anything if the floor is covered in water. In fact, it is far easier to do work to the ceiling, lighting and so on while there is a frozen surface to work on, and then wash all the resulting dirt away when the ice thaws. Alternatively the roof work can be done during the installation process and simply sweep the dirt off the ice surface before proceeding, with any remaining dirt usually lifted through flooding. It is also possible to cover the ice surface with large sheets of plastic if there is a particularly filthy job to be done. It is a judgement decision, with proper planning and a realistic timetable.
Most roof work will need scaffolding, usually a tower on wheels, and the wheels don't get on too well with the ice. What does work is a piece of thick cardboard under each wheel and simply slide the thing along – if the cardboard sticks to the ice under the weight of the tower, simply give it a little kick to loosen it and it will slide. A small platform lift is also very good, but ensure that the wheels can cope with the cold ice, because many materials do not like to be frozen and can crack or break. So, while there is a tower about, clean everything up there, check all lighting and other equipment and repair/replace as necessary.
All walls, partitions and walkways too will need a thorough clean, and it is vital to minimise traffic from anyone not needed in the building. Once the pristine new floor is being installed dirt will be the enemy, and anyone who dares walk into the place in outdoor shoes should be given a proper education in any manner that works. Unfortunately many curlers simply WANT to walk on a sand floor or a newly painted surface to see what it feels like without ice. At the end of the day, the cleaner the entire building, the cleaner the ice. As for walkways, carpet tiles work best because they can easily be changed and cleaned. At the top end will be closed loop carpeting, while the bottom end will shed fibres and need very regular vacuum cleaning until the loose fibres are under control.
For all surfaces to be painted it is vital that the surfaces are properly prepared and that the paint is properly applied, or it simply won't stay there. A curling rink is a very damp environment once water is introduced for the floor and only the best paint should be used, strictly according to the manufacturer's instructions – always ensure that the minimum recommended temperatures are maintained until the paint is properly cured, which generally will mean at least 10ºC for a week.
The outer walls, doors and windows deserve special attention. Whether the outside humidity is higher or lower than inside the rink is not the point, the important point is that water will migrate into or from the rink to compensate. This moisture has to be controlled by the dehumidification equipment and should not be necessary – trying to dehumidify the outside air is an expensive business, while loss of moisture from the rink can easily lead to sublimation of the ice surface. Seal the outer walls from the outside with a coat of diluted PVA and a few coats of good paint if there is a problem, while the inside too can be sealed in the same way. Ensure that all doors and windows close properly and will remain sealed while closed. The roof itself is not usually a problem, but if it leaks there will be quite a few problems – do the repairs while the roof is accessible in the warmth of summer sunshine, clean the gutters and check that all drains are functioning properly.

5. Equipment

It is very common that people, such as the Board or Management, think that all the work can be done in the week before the plant is switched on, and the most common reason is expense. Why pay someone to be "playing the fool" in an empty curling rink that is generating no revenue throughout summer, when he can be used somewhere else actually doing some work? These very people will then have to pay the bill when things go wrong, because the equipment has not been properly maintained. The cars that break down most are the ones which have not been properly serviced at regular intervals.

The refrigeration plant, and anything associated with it, must be maintained to the highest standard. This simply means that you really cannot do it yourself, and unless you are a fully trained and skilled refrigeration engineer you should not be doing it. Unfortunately these guys cost money, a lot of money, which also has to come out of the ice fees, just the same as everything else that has to be paid for. However, this cost can be reduced by doing all those things which you can do yourself, even though you don't really want to do the work, the messy work, the dirty work, the work no-one else wants to do.

Cleaning something properly is a worthwhile exercise. Not only do you learn about all the bits involved and what they do, you also see some very small problems that usually go unnoticed and develop into plant failures. Refrigeration plant work under high pressure, turning liquid into gas and gas into liquid, pumping secondary refrigerant around miles of pipework to make and maintain ice. In order to spot leaks it certainly helps if everything is beautifully clean with not a spot of anything dripping onto the floor, so that when anything does drip onto the floor it is very easy to see. Gas can be more difficult, but the signs will be there and can be seen if nothing else is hiding them, like dirt. Clean the plant and keep it clean. Clean all the pumps, pipes, gauges, headers, returns – everything, clean it spotless and keep it that way. Clean the condensers, fans, connections, stands, brackets – everything. The first time will not be much fun, but the next time will be easier. Look for hairline cracks, tiny patches of damp, anything that doesn't look right, and when the refrigeration engineer arrives you can save his time and tell him what worries you. He will probably be able to fix it within minutes.

In older facilities there will be many hundreds of clamps holding the pipes onto the headers and these must be carefully inspected and replaced if needed – fortunately modern plastics don't need these clamps, but they still need looking at. Another terrible job is replacing the return bends, especially if they are embedded in twenty years of dirt and now swimming in a mess of brine and whatever else, so be sure to plan this job before it becomes a very messy problem, usually during summer in the off season.

Because of the cost of primary refrigerant it is customary to remove the gas from the system into a cylinder and store it until needed again. What happens now is that the system is no longer under pressure, but all the seals will be prone to drying out and will leak when returned to pressure. A competent engineer will replace all the seals before returning the gas to the system, and the plant will again be fit for a season with – hopefully – no leak of very expensive gas. We are not competent refrigeration engineers, but we have learnt to find one, to trust him and to pay his bill on time. It pays for itself if no extra bottles of gas are needed. It pays for itself if the plant is working at its optimum efficiency and saves even 10% of the electricity bill.

The dehumidification plant will also need a thorough service, usually by engineers from the manufacturer but often by a competent refrigeration engineer – modern mechanical dehumidifiers use the same principles on a smaller scale. Desiccant dehumidifiers have complex computer systems that need to be checked to ensure maximum efficiency, and the desiccant wheel must be regularly inspected – the manufacturers will have the equipment and computers to do this quickly and properly.

Heating equipment, and there are many different systems, also need proper maintenance. Special attention should be paid to all thermostats and control gear involved, because one faulty stat can cost a fortune in wasted energy as the air gets too warm and the heat has to be extracted through the floor. Where there are fans, filters and ducting involved there will be dirt and dust, and these must be cleaned to prevent causing a million pick-ups during the curling season.

The cutting equipment will be less of a problem, as the modern machines are well designed and need very little maintenance. The blades – or at least some of them – will need a regrind, and summer is the time to deal with these. Our advice is to find the best firm there is and stick to them, regrinding a blade for use on curling ice is a highly specialised business that has to be done just so. Looking after the batteries will vary from make to make, but usually the manufacturers and/or suppliers will be able to suggest the best way to maintain the batteries through the summer when they are not in use.

The stones will be dealt with in *MAINTAINING THE PLAYING SURFACE*.

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