

Scottish Curling-Ice Group

A PLAYER'S GUIDE TO CURLING ICE

Overview

For many hundreds of years curling ice did not exist. What they played on was simply frozen water, usually on a lake or pond, when the weather became sufficiently cold to freeze the surface to a depth capable of supporting the weight of the players and their stones. Gradually rinks evolved where a roof and walls would keep out the worst of the weather, but natural coldness was still used to freeze water applied to a level surface. Then came artificial refrigeration, where heat was extracted through the floor to freeze the water, allowing for more control of the ice surface and the duration of the curling season. Playing on any of these surfaces was hard work, but still enjoyable, and improvements in the refinement of the ice surface were gradual and – to the current generation of curlers at the time – of little consequence.

During the past few decades change accelerated. Insulation, heating of the air, the introduction of pebble and cutting of the ice surface advanced in matching pace with the advances of modern technology. In the past few years alone the application of science resulted in a new concept, which we refer to as curling ice. Modern curling ice is a precision product of science, knowledge, experience and regular hard work, most of which go completely unnoticed by most players of the game. Only when the product fails do they notice a difference, usually through damage to the ice surface, which they will refer to as fudging, flat pebble, picks or funny lines. If a technician succeeds in controlling all he can and provides an excellent playing surface for the duration of the game he will be praised, but if anything goes wrong he will usually be blamed. Yet most curlers know so little about curling ice and the damage they themselves inflict upon it, that technicians often simply turn their backs on the problems and hide away.

It is no surprise to ice technicians that specific rules are now being introduced to control the behaviour of players who damage the ice. It is not a case of rigidly enforcing specific aspects of damage that may or may not be witnessed, it is simply recognition that players need to be aware of the ice surface and protect it for their own sakes. It is the purpose of this report to explain some of the relevant aspects of curling ice and to educate players on the problems they themselves are responsible for. Any player or team who has lost an important game because of an unwanted pick-up or sudden change in the course of a stone's progress will know how important this can be, as they will know that the problem may not have been caused by anyone on the ice at the time.

The ice surface

Level

In the absence of any contradictory evidence it has always been assumed that "water will find its own level" – fill the area and wait for it to freeze. Science has proved that this is not the case, and thanks to considerable modern research technicians have developed ways to install an extremely level ice surface. It is more level than a laser level can accurately record, which is within 1mm over an area of at least 1000m², and now it is believed that a curling stone will find any discrepancy in level which exceeds 0.05mm over the width of a sheet of curling ice. Achieving this degree of accuracy is a very skilled job and will require some two weeks under average circumstances. Get it right and it will be possible to maintain the level for many months, but if it is not truly level and well maintained the level will soon deteriorate and require further floods to cure the problems. See the report on *Level*.

Maintaining the level is a different challenge. Everything done to the ice surface, deliberate or otherwise, WILL affect it, and this will have to be taken into account by the ice technician. The most common influences and effects are:

- **Pebble.** Every time the technician applies pebble to the surface, he is sprinkling water to the best of his ability over an area of some 250m² per sheet, in such a way that it is completely even and consistent. This is very difficult, yet he will do it again and again during the day, each pebble over and between the previous pebbles, until it is virtually guaranteed that the surface will not be level any longer. The ONLY way he can repair or restore the level is to remove the pebble by cutting it off with a very sharp, straight and even blade. If he has applied large pebbles, or too many layers in succession, he will have a very difficult task on his hands, and he will do very well if he restores the level back to the original ice pad or to a level surface of pebble. For this reason it is now becoming more and more common for a technician to cut the pebble off before the layers accumulate too much, usually after say three layers of fine pebble – in a busy rink this will mean at least twice a day, while a serious competition will remove every pebble before the next game to start from new. Should the technician not be given the time and help to do this, it would be unfair to expect a level ice surface from him. See the report on *Cutting Technique*.

- Sliding delivery. A curling stone applies a pressure of about 1kg per pebble, and a player about 1.5kg. Along the line of delivery, usually from the hack to the hogline, the pebble is subjected to considerable damage. The result is that the ice along this line becomes more compacted than anywhere else and, gradually, becomes harder and harder. Soon it is so hard that not even the sharpest blade will cut it, so the area gradually rises in level. Now the blade, if not centred over the area, will rise on the higher area and dig into the softer lower areas beside it, aggravating the problem. Even if the blade is centred over the area it has been proved by expert technicians that the blade deforms and adopts the shape of the pad, making it impossible to correct the level. Again, if the technician does not deal with this, the problem will get beyond his control and stones will become increasingly reluctant to draw into the centre, especially once they reach the hogline and the house.
- Area of play. Average players tend to play more randomly, while better players play nearer the centreline. This too results in a higher centre area for the same reason as above, and is the main problem addressed by the report on *Cutting Technique*. Cutting ice "down to level" is now a highly skilled business, which takes time and effort, and has more success if done regularly. Every modern curling rink will be well advised to schedule games in such a way that the time and manpower will be available.
- Heaving. Older rinks with sand floors and poor insulation beneath will start heaving around February, as a result of permafrost forming beneath the sand with lenses of pure ice within. These lenses act as hydraulic jacks that raise the floor in the area, resulting in a surface that is not level and cannot easily be made so. If the permafrost is not allowed to thaw during the summer the problem grows from year to year, and even rinks with a concrete floor can be affected if the insulation is ineffective or the heat mat fails. Heaving has destroyed many ice rinks, and any rink will be well advised to install a modern floor to specification and ensure that permafrost cannot form.
- Spillage. Should water, or any other liquid that can freeze, be spilt onto the ice surface, at least some of it will be frozen to the surface long before it can be cleared. Once fully frozen it will be very difficult to cut off and restore the level, a task that will require removal of the hump with a sharp hand scraper before the normal cutting can begin. Players are well advised not to take any liquid near the ice, to ensure that spillages cannot occur.
- Sideboards. It was believed for many years that the ice closest to the wall will be affected by the warmth and gradually become lower as the ice sublimates. Although this can be the case, it is now clear that the lower sides are caused by incorrect installation, where insufficient water is deposited along the sides and the pad is therefore not level to begin with. However, the warmth can and probably does affect the ice surface a little even if only by raising the ice-surface temperature a fraction, causing stones to behave differently and leading to the observation that the sides are low. In a well designed curling rink there will not be a problem, provided the ice is correctly installed.

Pebble

Dealing with level above has largely addressed the level of the ice pad, which is beyond the responsibility of players, as long as the technician is competent and given the time to do his work. The area that is within the responsibility of players is certainly the pebble, which is the real playing area. The report on *Pebble* deals with the subject in more detail, yet it only scratches the surface (appropriate, here!), because it is a massively complex subject. To simplify the matter we must assume that the technician has dealt with the level and has provided an excellent pebble, that will allow the stones to draw four foot anywhere in about 24 seconds hogline to teeline. Play can begin, and these are the problems that might occur:

- Temperatures. There are many temperatures involved in pebble. Generally these are in the hands of the technician or a computerised controller of some kind, and should not normally be a problem to players. However, it is now clear that many things affect the temperature of the ice surface and therefore the behaviour of the stones. The most significant is condensation, where a quantity of water vapour condenses onto the ice surface and releases energy, in this case as heat. It can cause the temperature to rise by as much as 1°C, which will result in stones slowing down quickly or players slipping. There is nothing anyone can do about this beyond gradual adjustments of the parameters involved. Similar effects can be the result if a player lies on the ice for a few seconds, allowing heat from his body to warm the ice in that area – it will take a few minutes for the temperature to return to normal, during which time a stone can be affected should it pass over this area. Standing in one place for a few minutes will have a lesser effect and can usually be ignored.
- Teflon soles. Teflon is a very hard and strong substance that can, and usually does, damage the ice surface. From the sliding delivery (see above) all the way to the finish of the slide the sole is literally shaving the surface of the ice, removing some of the pebble, with the sliding line showing the first signs of wear. It is essential that all the sides of the sole are smoothed with emery paper or a suitable fine abrasive to ensure that there are no sharp edges, especially when the shoes are new. Shoes with plastic tiles are less of a problem, but need careful attention as well.

- Ice fragments. It is almost impossible to see these tiny fragments of ice where they lie on the ice surface, usually between the pebbles. Because it is ice on ice these are not bonded to the surface and can go anywhere, even onto neighbouring sheets – all it needs is a kick from a foot, or a bump from a sweeping implement. They are created by sliders, crutches, the backs of brushes (especially plastic brushes) and anything hard enough to remove fragments from the tops of the pebbles. If there is a white scar in a line (usually when delivering a stone), there will be a thousand potential pick-ups lying about for the stones to find. Once found, the stone will be turned over with nothing to see, because the fragments are virtually invisible.
- Fluff. This stuff is made from very fine fibres of clothing that will always be shed by curlers. Fleeces are the worst culprits, although non-shed fleeces are an improvement, and it is important to curl in clean clothing and where possible clothing designed for curling. After a day's curling the fluff will settle on the ice surface and be cut off, and AT LEAST a teaspoon's worth can be collected from one sheet of curling after only one normal game. It goes without saying that it needs only one fibre of fluff to cause a pick-up, and only effective sweeping will keep players ahead of the problem.
- Dirt, dust and hairs. When a sheet of ice is prepared, the surrounds vacuumed and even the passages cleaned, the ice technician has done all he can to provide a clean surface for a game of curling. Whatever dirt appears on the ice after that must therefore come from the players, one way or the other. Most of it can be avoided, while the rest will be sufficiently visible to deal with during the game or be swept aside. It is important to note that any loose dirt can and will go anywhere in the rink, and there can be nothing less fair than bringing in dirt to ruin someone else's game. If a piece is spotted on the ice, pick it up and dispose of it in a bin – or keep it in your pocket. Clean the brushes and pads over a bin away from the ice, not on the ice.
- Knees, elbows and flesh covered in cloth. Although this is seen as a large problem, it is less so than most other problems on the pebble. A knee might well melt a hole in the surface, but the water will be soaked into the cloth of the trousers and the hole will not affect a running stone much at all. However, these holes are usually on the sliding path, and any trailing knee passing through it will feel some pain. These marks are unnecessary, unsightly and – unless they are filled in by the ice technician as part of his routine – will accumulate to the extent where they will affect stones. They are also very easy to see and it is certain that umpires will use them as a reason to enforce the new rules, should they so wish.
- Fingers and bare flesh. The human body has a temperature of about 37°C, which is 41°C warmer than the ice surface. A thumb or a finger only needs to be in contact with the ice for a few seconds to melt it, and the water will largely remain on the ice surface to freeze again into a lump that had not been there before. These lumps WILL affect a curling stone and MUST be avoided. If there is a particular damage that will justify an umpire's decision to ask a player to leave the floor, this is it. There is no evidence that these lumps are harmless, and there is substantial evidence that they can destroy a game by affecting just one important stone.
- Sweeping. There is considerable anecdotal evidence that the harder a player sweeps, the further a stone will travel and the less it will curl. There is similar evidence that pads with relatively rough textures are more effective than brushes. Unfortunately there is very little scientific evidence or even data to support these assumptions. What is however certain is that hard sweeping will damage the pebble, similar to the damage done by teflon sliders. Detailed research will continue and hopefully the evidence will emerge, but it is already clear that efficient and vigorous sweeping is more effective than hard sweeping with heavy weight.
The principal misconception is that sweeping warms the ice surface, allowing or enabling a stone to travel further. Under certain very specific conditions this can be the case, but for at least 99% of the time under normal curling scenarios it is impossible – in fact, if the ice surface did warm up significantly, the stones would slow down and draw more. It is quite safe to assume, according to the science available, that sweeping only cleans the very surface of the pebble by removing the frost from it, said to be as thin as one micron (0.001mm) or less, and this will allow the stone to travel further and straighter. See the report *Sweeping And Ice Temperature*. The nature of the frost will dictate which implement will work better, with a brush being the more effective for thick and warm frost caused by condensation and a pad better for thin and cold frost caused by deposition. In both cases it is removal of the frost that is important, not warming the pebble.
- Stones. In cold rinks stones will usually draw less. It is becoming increasingly common for technicians, expert or otherwise, to roughen the running bands with sandpaper and so create more draw. Now the stones have more friction and grind away at the pebble, which has to be colder and harder to last a game, which again makes it more difficult for the stones to draw. It is a vicious circle, and the best solution is to allow stones to naturally mature and then to leave well alone and simply adjust the ice temperature. Players who ask technicians to have the stones refurbished usually have no idea of what they are talking about. And players who insist on using the high-swing delivery must beware, the new rules regarding damage will get them into real trouble.

- The sliding line. Players sliding from hack to hog usually do so along the same line. Unlike the compaction problem in level over a long period, this line will become worn during a game and become lower than the rest of the surface. If this is not dealt with it will become a shallow trough from which a stone cannot escape. This is why technicians try to pebble the strip very lightly between games, although they may not pebble the whole sheet, and if they put down too much pebble the area will of course rise above the sides. Players can't do much about this, but again it is important that technicians have sufficient time between games to apply pebble where needed. A good technician will be able to control the level from day to day by cutting the sheet level every morning when there is more time.
- Cleaning stones. Many players are in the habit of cleaning their stones against the hack and returning the stone to the ice with a decent "clunk". Any ice that is broken from the surface will now be scattered, unseen, all over the place, and also in front of the stone which has now to be played, and often through the very dirt that has been cleaned from the stone. Another problem is that players use their bare hands and so warm the running band of the stone, which now has a different relationship with the pebble. For cleaning a stone it is best to use the brush or pad, lightly, away from the hack, with the dirt swept towards the backboard. Modern curling ice is now so clean that the stones need very little attention – in fact, if a stone is cleaned well at the start of the game, and the players keep the surface clean, it shouldn't need much cleaning at all during the game.

Summary

There is a saying amongst ice technicians: don't let the curlers on it, they'll only mess it up. Fortunately their tongues are firmly in their cheeks, because ice technicians make ice for people to play on, and they take pride in their work. To see a beautiful pebble abused by one or two players – and there are seldom more than that – could be considered part of the job too, but it could equally be considered to be malicious damage to someone else's property.

This report, and the new rules, are not there to attack the behaviour of players. The players will always damage the ice in some way the moment they step on it, and very few will damage it badly. However, considering the crucial importance of the ice surface in any game of curling it is perfectly right that players should be asked to damage the ice as little as possible, and to do so for their own good. In this era of high-specification modern curling ice ANY damage is likely to affect the stones and EVERY player should learn how to behave responsibly during a game. The best way to do so will be to develop a healthy and constructive relationship with ice technicians, develop the good habits and change the bad ones. Curling ice is a very special surface that needs very special treatment by everyone.

Curling stones provided for any game are a constant and will not change during the game. Dirt will be from the players, and only they can control the causes. The water used for the surface is however not a constant and it is as well to remember that it is water, at a very specific temperature. Without the very peculiar characteristics of water the game of curling would not be possible, and modern curling ice exploits every scientific aspect of water to its maximum. If the ice technician gets it right the result will be wonderful to play on, but if the players damage the surface beyond the necessary the game will not be the same.

See also the report on *POG* (Problems On-going).

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