Scottish Curling-Ice Group

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Four vs. Six

Over the years many curling rinks, if not all, have been built to cater for local demand at the time. The most common choice has been between a four-sheet rink and a six-sheet rink, with little reference to the ice technicians who would have to maintain the ice pad. With the recent advances in curling-ice technology it has become clear that it is very much easier to maintain four sheets to optimum standard than six, and there are many obvious reasons why. While it is possible to produce good curling ice on six sheets it is not easy, and more often than not the standard is not satisfactory. The principal reason given, and probably rightly so, is that the ice is also used for skating on a regular basis, leading to the weekly flip-over scenario. The next reason will be a lack of time, or staff, or equipment, or the design of the building. The justification for building a six-sheet curling rink is invariably local demand and increased revenue, which in cities can well be the case. But **is it really cost effective or even necessary?**

Despite careful search, no data exists on this comparison. It is the purpose of this report to investigate the various aspects of providing good curling ice on a regular basis, using known methods of evaluation that will apply anywhere. The specification the ice will have to live up to comes from the WCF in their manual *Curling Ice Explained*, using not only the specific definition of curling ice but also the general guidelines. In short this means that stones should curl four foot from end to end at draw weight, anywhere on the sheet, in a time of 26-28 seconds tee-to-tee. This should be possible from the first stone of the first game of the season to the last stone of the last game, and this is achievable. This kind of ice has been labelled "formula ice", which should be achievable in any rink – this is not "competition ice" or "championship ice", which might be the same thing in a good scenario but is usually considered the territory of experts. To complete the definitions, hastily produced flip-over ice is referred to as "borrowed ice", while better prepared ice including a flood will be called "club ice". Curling-ice technicians now refer to this ice as "frozen water", because it is usually not up to the standard required by "curling ice".

Formula ice is achieved through regular maintenance and carefully developed routines. Through these it is quite easy to calculate the time taken for each task and the distance walked, with a good understanding of the amount of energy needed by the ice technician. The routine will be fairly identical for frozen water as well as for good curling ice, with the result very much dependant upon the skills and experience of the technician(s). It must however be emphasised that ice makers of the past worked under difficult circumstances in poor buildings not always well equipped and could only do their best, while competent technicians are now working with science and the right equipment, both of which contribute to the quality as well as the cost effectiveness of the work.

In the table below the work is to provide ice for four sessions a day: two during the day and two in the evening. Every morning a technician will arrive at 0800 and have the ice fully prepared by 1030, with some additional freshening between sessions. It is now becoming the norm to prepare the ice again for the evening games, again with a little work between the two sessions. The work shown is very much the realistic minimum as performed by a single competent curling-ice technician. The following is relevant:

Preparation	It takes about 40 minutes for the blade of the cutter to "chill" on the ice before it can be used. During this time the technician will inspect and deal with damage (hands, knees, etc.) and obvious dirt (grit, mud) that could damage the blade's precision edge.
Cutting	This will vary, but the average for a full cut is about 15 minutes per sheet, during which time as much of the previous day's pebble as possible is removed in a careful, systematic way.
Cleaning	The snow left from the cutting has to be cleared and disposed of, with the surface left as clean as possible for the fresh pebble.
Pebble	The base pebble consists of a single pebble in two directions for every sheet, while extra pebble between games will be a single in one direction only.
Nipping	This is the quickest and best way to equalise the fresh pebble and provide an instantly consistent surface. The Nipper is now used instead of the cutter's blade, and the snow is picked up on the blade and also the sheepskin mop dragging behind it.

All other tasks like heating water, blanking scoreboards, emptying bins, light cleaning and so on are slipped in somewhere in the routine, as well as keeping the log and parameters accurate. The time it takes to perform a task is measured in minutes, as it takes on average a minute to work from one end of the rink to another, and the distance involved is about 50 metres each time.

	Time (min)			Distance (m)		
Sheets	**1**	**4**	**6**	**1**	**4**	**6**
Morning						
Preparation	10	40	60	100	400	600
Cutting	15	60	90	750	3000	4500
Cleaning	5	20	30	200	800	1200
Pebbling	2	8	15	100	400	600
Nipping	3	15	20	150	600	900
	35	**143**	**215**	**1300**	**5200**	**7800**
Afternoon						
Preparation	2	8	12	100	400	600
Cutting	8	32	48	400	1600	2400
Cleaning	5	20	30	200	800	1200
Pebbling	2	8	15	100	400	600
Nipping	3	15	20	150	600	900
	20	**83**	**125**	**950**	**3800**	**5700**
Between						
Preparation	2	8	12	100	400	600
Pebbling	1	4	6	50	200	300
Nipping	2	8	12	100	400	600
	5	**20**	**30**	**250**	**1000**	**1500**
Totals						
Per shift (day)	40	163	245	1550	6200	9400
Per shift (night)	25	103	155	1200	4800	7200
Per day	**65**	**268**	**400**	**2750**	**11000**	**16600**
Minutes/day free		692	540			

For the four-sheet rink it is clear that the technician on day shift will need 2hrs 23mins to prepare the ice in time for 1030, which leaves him very little to spare, and he will have covered about 5.2km. Referred to as **the 5K mark**, this is the point where the technician will feel tired and will need rest, considering that he is working in a relatively cold and dry environment and walking on a very hard and slippery surface, usually manipulating a piece of awkward equipment as accurately as possible. For the six-sheet rink he will need 3hrs 35mins, which he doesn't have, unless he starts at 0700 or has some help, and he will cover about 7.8km. It is the 5K mark that suggests that no technician should be expected to prepare six sheets a day every day all on his own, because it is very tiring and he will not last long unless he takes quite a few shortcuts. These shortcuts lead to mistakes, which accumulate, which need more time to deal with, which means even more work for the technician on the next day, and everything starts going wrong and heading towards frozen water.
For the evening shift things are a little easier, but for the six-sheet rink there is little time for the resurfacing and without help the technician will struggle. Between the evening sessions there is also very little time for the pebble and nip, and curlers will have to wait at least thirty minutes before the last game, unless the technician has help.

With the essential work taken care of, the technician can now have a well-earned rest. In the four-sheet rink there will be about 11hrs spare time between the two technicians for the day, while the six-sheet rink will only have 9hrs between them. However, the six-sheeter will have two technicians on duty for each shift, so they will have 9hrs each, or a total of 18 hrs. Unless this time can be occupied without wasting their energy too much, it should be considered wasted. Experience has shown that a four-sheet technician can find plenty to fill his time, but there are limits, and **at least 8hrs will go wasted in a six-sheet rink every day**. This will be the time when technicians learn to play cards, or surf the internet, or have endless discussions about their next car or the planned holiday. The question will now be asked whether this is economical at all. The fact remains that **someone has to be on duty at any given time, from 0800 until 2300.** In a quiet rink with no more than one session on average per day the work can be done by one technician working a split shift, but in a busy rink this is impossible – fortunately the busy rink generates sufficient additional income to afford extra technicians. Using volunteers or part-time help is seldom the answer, as they can easily do more damage than they're worth.

In order to cover the daily hours of a busy curling rink for seven days a week and 35 weeks, the law does no longer allow willing horses to carry the load for too long. With variations possible as required by changing curling patterns, especially during weekend competitions, the following is a useful illustration for technicians A, B and C:

		Mon	Tue	Wed	Thu	Fri		Sat	Sun
Week 1	0800-1600	A	A	A	C	C	0700-1700	C	C
	1600-2300	B	B	B	B	B	1300-2300	A	A
Week 2	0800-1600	C	C	C	B	B	0700-1700	B	B
	1600-2300	A	A	A	A	A	1300-2300	C	C
Week 3	0800-1600	B	B	B	A	A	0700-1700	A	A
	1600-2300	C	C	C	C	C	1300-2300	B	B

A	B	C
24	0	36
20	40	0
0	36	24
40	0	20
36	24	0
0	20	40
120	120	120

The pattern can be repeated indefinitely, without breaking the law, and with the option of some overtime when needed. Should a technician be ill or take a holiday, a relief technician can be drafted in to take his place on the roster, or a technician learning the skills can be given a chance to prove himself. This is a much neglected aspect of the work of curling-ice technicians, where they are assumed to be qualified and competent simply because they turn up for work every day – it can take at least a year to teach a technician the essentials, and another year or two before he will be fully competent, and training on the job is essential. In the days of frozen water this might well have sufficed, but in the modern environment it is simply not good enough.

Here it must be emphasised that **practices of the past cannot be used to plan for the future**. The evolution of curling ice has been slow for many decades, yet extremely fast during the past five years, as the science has been unearthed and put into use. Learn from the past, yes, but use fact and science to plan for the future. To say that the ice is "the same for both sides" or "I have enough customers, I don't have to try harder", is saying that curling ice should be buried in the mists of time, unworthy of progress – it has been proven that well-maintained ice is easier and more economical to work than poorly maintained ice. Furthermore, once curlers discover the joy of curling on good ice, they will never want to go back to frozen water, and it is overwhelmingly clear that **good ice is the future of curling.**

Most curling-ice technicians do not earn much at present, while the ones who do earn a reasonable wage are reluctant to provide any information. Neither will curling rinks make public their accounts, for whatever reasons, making it very difficult to establish guidelines. The table below therefore starts from scratch, with the minimum wage as the lower end and a newly qualified graduate at the higher end. Curling ice has rightly been described as a permanent university-degree course, and paying a competent curling-ice technician also acting as manager £25k per year is not unreasonable by any standard. Based on the requirements of the workload described above, the following provides some guidance on the costs involved to ensure that the work will be done to the standard required for good curling ice in the modern environment:

	Hour	Week	Month	Year
Office (O)	6	240	1040	12480
Part-time (PT)	6			
Jun Tech (JT)	8	320	1408	16900
Ice Tech (IT)	10	400	1735	20800
Manager (CM)	12	480	2085	25000
Ice Master (IM)	15	600	2600	31000

4	IM+2CM	1CM+2IT	3IT	1CM+1IT+1O
	81000	**66600**	62400	58280
	Best	Good	Maybe	Impossible

6	IM+2CM+3JT	IM+2IT+3PT	IM+3IT	IM+3JT
	131700	**103000**	**93400**	81700
	Best	Good	Maybe	Impossible

For the four-sheet rink, it will be possible for three ice technicians to cope with the daily work, but they will not yet have sufficient experience to deal with unusual problems or anything other than the basic job in hand. Introduce a competent technician/manager who can, and the system becomes workable. However, the manager will have his hands full if he has to work the ice on a shift pattern and also do all the other work that managers do, so it will be more beneficial to **have three competent technicians**. One of these will take overall responsibility for the ice, while all three will share the managerial duties while they are on shift. There will also be scope to employ part-time help or junior technicians, but this will be dictated by income and an increasing workload. If all three technicians are fully competent, there will be no need for an additional complex manager, with a saving of some £15k.

For the six-sheet rink things are more complex. Because six sheets need a considerable amount of experience to keep level, every mistake can become serious, especially if the mistakes are allowed to accumulate. An ice master will be essential, but who will do as he instructs? On paper three junior ice technicians seem a good idea, until it becomes clear that they cannot pebble evenly, they don't have the discipline to stick to the rules and, because they don't understand the importance of each task, they take shortcuts whenever they can. Three ice technicians who do have some knowledge and experience might well cope, but when the ice master is not there they will still not have the experience to deal with unforeseen problems. They will also find the workload difficult to cope with, as was explored in the time-and-motion study above. Add some part-time help to the workforce and this problem will be solved, providing nothing goes wrong and they do exactly as they have been told. The best scenario will undoubtedly be to employ an ice master, along with two competent ice technicians, and have three junior technicians working alongside them not only to absorb some of the workload, but to learn on the job as the year progresses. The three seniors can then also manage the complex because there is time, but even so there will always be those wasted eight hours per day.

It is important to realise that this kind of work in a curling rink is no longer dealing with frozen water. The work of a curling-ice technician is a challenge most professionals will find daunting, not only because of the physical side but mainly because of the complex nature of water at many different temperatures. As the work schedule shows, there is very little time to do the work, and certainly very little time for mistakes. Once the 5K mark is reached the brain is less responsive and can easily forget a very small thing that can lead to a very large problem – simply forgetting to adjust the refrigeration plant will mean the ice is too warm and the surface will be unsafe and unsuitable for curling. In the modern scenario curling ice is a product of science, produced by a professional curling-ice technician, and to pretend otherwise is to turn the clock back a few decades.

For a busy rink, either four or six sheets, there has to be sufficient competent technicians to deal with the work. If there is sufficient income, then this will mean at least three technicians for the four-sheet rink and at least four for the six-sheet rink. The figures above show that the difference in cost is substantial, some £50k at the top end, £36k if needs be and £30k as a minimum.

Generating sufficient income is not as difficult as it might seem, provided the curling rink has a good catchment area. Ensure that there is good curling ice to specification as discussed above, and the curlers will come from far and wide. Provide a friendly and healthy social atmosphere and the rink will become the focus of activity for many hundreds of curlers. Add to that an occasional bonspiel and a few serious competitions and all will be well.

The first question is the catchment area. Research shows that most curlers will think nothing of driving 30mins to a rink, and even 40mins will not put them off. Beyond that time there will have to be a very good reason, which is usually because there is nowhere closer to curl. Often this will be because a more local rink has closed and its curlers have nowhere to go – building a large rink simply to absorb these will not be a good idea, because if they rebuild their own rink they will return there to curl. Often it could be because the ice at their own rink is little better than frozen water – building a large rink to cater for them could also be disastrous if they succeed in employing a skilled curling-ice technician, who succeeds in winning back his customers. It is by far the safest to **concentrate on the local catchment area and provide for those local curlers.**

The quality of ice should not be an issue, because specification is specification. The fact remains that curlers like to travel for the odd competition and especially if rumour has it that the ice is good, and if the social side matches the ice there will be happy competitions – schedule a few of these carefully and make the effort, and the rink will benefit. However, curlers can quickly resent a sequence of competitions replacing their weekend rituals, and competitions are hard work for curling-ice technicians with little additional reward.

From the time-and-motion study and shift patterns the possible ice availability can be developed. For the six-sheet rink a session in the morning and again in the afternoon is easy, but only two evening sessions will be possible – there will not be sufficient time to prepare ice for the evening if the ice time is filled by another session. There will also need to be extra time in the schedule between the games to ensure that these **peak-rate customers get what they pay for.** Many rinks have tried doing away with ice time and playing as many as three games on one pebble, with resulting loss in quality and gradually a loss in curlers. For the four-sheet rink an extra session in the late afternoon is not a real problem because of the shorter time needed for ice work, and pebbles between games will not be difficult either. This extra session is at this stage optional, but it will be clear from the tables below that three sessions on four sheets equal two sessions on six sheets, while the extra two sheets during the day will be the only additional ice shown for the six-sheet rink. In the tables below each unit equals one curler for one game, and ice times are as described in the time-and-motion study.

	Daytime							Evening								
6 sheets	1030-1230		1330-1530		Ice	1600-1800	Ice	1830-2030		Ice	2100-2300		Total		Free ice	
		6		6	6		6	6		6	6		6		6	
M		24		24	2hrs		0		48	30ms		48		144		96
T		24		24			0		48			48		144		96
W		24		24			0		48			48		144		96
T		24		24			0		48			48		144		96
F		24		24			0		48			48		144		96
S		24		24			0		48			48		144		96
S		24		24			0		48			48		144		96
Total		**168**		**168**			**0**		**336**			**336**		**1008**		**672**

	Daytime							Evening								
4 sheets	1030-1230		1330-1530		Ice	1630-1830	Ice	1845-2045		Ice	2100-2300		Total		Free ice	
	4		4		4	4	4	4		4	4		4		4	
M	16		16		1hr	32	15ms	32		15ms	32		128		32	
T	16		16			32		32			32		128		32	
W	16		16			32		32			32		128		32	
T	16		16			32		32			32		128		32	
F	16		16			32		32			32		128		32	
S	16		16			32		32			32		128		32	
S	16		16			32		32			32		128		32	
Total	**114**		**114**			**224**		**224**			**224**		**896**		**224**	

The totals show that the six-sheet rink has accommodated 1008 units, while the four-sheet rink has accommodated 896 units. The difference is simply the additional two sheets of daytime ice that the six-sheet rink can provide on average, and for the purpose of the analysis this can be considered as irrelevant. The question is really whether two sessions on six sheets will be better than three sessions on four sheets. Also, the free ice (ice prepared but not used) totals show that the six-sheeter has 672 units, while the four-sheet rink only has 224.

The usage described here is an average over 250 days and there will be variations, but the method of calculation is surprisingly accurate. The extra session for the four-sheet rink is optional and flexible – the real question is whether two sessions will be sufficient for current demand, bringing the total down to 672 units. Most curlers will curl once a fortnight on average, which means that **the four-sheet rink can supply ice for 1344 curlers on average**. Should more ice be required a certain number of peak-time curlers will have to be prepared to curl earlier or during the day – from other rinks it is already clear that many clubs are prepared to do this, rather than curling even later at night, and the 1630 start will also enable junior players to curl after school. It is therefore quite clear that these figures do not justify the building of a six-sheet rink instead of a four-sheet rink, and the free-ice figures prove a wastage of three times as much for the six to the four, with no additional income to compensate.

From the usage figures it is now possible to calculate the potential income from ice fees. A rate of £10 per player per game ("per unit") is now common, and can easily be raised or lowered per pound by adding or deducting 10% from the totals. Figures in italics are not achievable according to the time-and-motion study; the additional income on the six-sheet figures will be from the extra two sheets of daytime ice as above; the minus figures represent lost income when the ice has to be flooded to restore the level, and these should be deducted from the totals. The figures in red represent the maximum, while the four-sheet rink will probably have a more realistic income of £232k until the optional extra session is introduced. The relevant totals are for two peak-time sessions and one daytime session, and for three peak-time sessions and one daytime session.

Ave Sessions	1	4	6
1 full peak @ £10	80	320	480
2 full peak @ £10	160	**640**	**960**
3 full peak @ £10	240	**960**	*1440*
1 full off @ £9	72	**288**	432

		1	4	6
Day	2+1	232	**928**	**1392**
	3+1	312	**1248**	*1872*

	1	4	6
250 days	58000	232000	**348000**
		-928	-6960
	78000	**312000**	*468000*
		-1248	*-9360*

So, doing the sums, the wages figures say that a six-sheet rink will cost at most £50,700 more to man properly, and at least £31,000 more, yet it can only generate £27,792 more at full peak capacity.

It is easy, and perhaps convenient, to say that curling-ice technicians should work harder and/or earn less, but with every reduction and shortcut the quality of the product will suffer. It is also easy to look at the figures and say that a six-sheet rink can also squeeze in the optional extra session and so make more money, but it is the opinion of experienced ice technicians that this is not as easy as it might seem on paper. It is correct to say that a full schedule in a four-sheet rink is easier to maintain, more cost-effective and more profitable, especially considering the eight wasted hours every day in the six-sheet rink, where the staff will have little to do.
All the above figures have only dealt with the maximum potential income against the minimum cost in the required staff. A six-sheet rink will also cost more to build and more to run, especially in refrigeration costs. Once the season is over the six-sheet rink will have to close down for the summer to save costs, while the four-sheet rink is small enough to keep going for an extra two months to provide ice for elite squads, general curling and practice and even a few competitions. This is useful time too for the ice technicians who can do experiments, refine new equipment or hold courses, work which cannot be done during the normal schedules. The six-sheet rink cannot generate extra funds to pay for these extra costs without a rise in ice fees, and it can easily be argued that the additional expenses will be a waste.
Looking at existing curling rinks in Scotland, some interesting information comes to light. The newest, Aberdeen, has chosen to split the six sheets into pairs, to allow areas to be worked individually without disrupting the curling too much. Even so it is said that the ice is not what it could or should be – gossip, perhaps, but a realistic assessment by better curlers all the same. Braehead has eight sheets and is well known for its variable ice conditions and temperatures, yet it claims to have the best ice – that is not what curlers are saying. Perth too has a less than healthy reputation amongst top curlers, although it is probably doing better than all the other large rinks. Stirling is planning to build its new (replacement) six-sheet rink soon, where flip-over ice will be continued, yet there is already talk that they will then build a dedicated four-sheet rink for curling next door to be able to provide better ice, and leave the other rink for skating. The very popular four-sheet rink in Kinross is oversubscribed, not only because there is nowhere else to curl, but mainly because it provides very good ice as standard. Stranraer, also a four-sheet rink, is making every effort to bring its ice up to standard and is succeeding, and is also regaining popularity. **It is clear that good ice is not easy at all to produce in a six-sheet rink, while it is not too difficult in a four-sheet rink.** It is also clear that curlers enjoy the more intimate atmosphere of the smaller rinks, whether for club curling, high-level practice or serious competition.
Considering the above analyses the question now has to be asked: why six. A six-sheet rink is expensive to build, expensive to run, difficult to staff properly, wasteful in many ways and not much use in summer. Just imagine the chaos in the clubroom when 48 players come of the ice at 2030 for refreshment, to join another 48 players waiting to go on at 2100 – if the bar is inadequately staffed there will be mayhem! And for the changing too, there will have to be larger rooms, many more toilets, more cleaning every day, more everything, yet the actual total number of curlers will not have increased – the curlers have simply been condensed into a shorter period of time. It can well be argued that more customers can be pleased during the two evening sessions, but will they be pleased?
During the planning stages of the Circle information was sought from all over the world, and especially from Europe. Ice rinks built to hockey size were found in all the new curling countries, providing curling ice on a flip-over basis. Many will only have five sheets, but those who can will fit in six. Is this why everyone is now convinced that six-sheet rinks are the future, by continuing the concept that flip-over rinks are better, or is the convenience of flip-over ice in less wealthy or less developed countries simply overlooked? And **it is for the future that these studies are done**, to learn from mistakes and decide how best to build a modern curling rink that CAN provide good ice for all its customers. This is why the Circle HAS to be a four-sheet rink, because everything points that way, while the six-sheet dedicated curling rink remains a very unproven concept. Yes, it can work, but no, it will not be easy and will need exceptional staff to produce good ice on a daily basis, never mind the cost.

Having examined the relevant facts, it can be said with confidence that the decision to build a four-sheet rink instead of a six-sheet rink will be factual and fit for the future. If a decision is made to build the six-sheet rink instead, it will be a political decision for reasons not suitable to be examined here, with the very serious risk of needing continued financial support for it to survive. The one positive aspect of a six-sheet facility is that it will be large enough to be converted into a skating rink should the curling taper off, and evolution will have come full circle back to the beginning.

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