

Scottish Curling-Ice Group

LEVEL, FLAT AND ALL THAT

Overview

It is not always possible to specifically define a concept in curling ice. In the preparation of *Curling Ice Explained* many words were created or adopted and every effort was made to ensure consistency in their use, yet several requests were received from translators for the proper definition of "pebble". What is pebble, what is level, what is scrape or cut or shave. For the latter the word "cut" was used when a powered cutter did the work, and "scrape" when a hand scraper did the work, and "shave" when the Nipper shaved the surface of the pebble, yet "cut" or "shave" could have served all three. The choice was always the word that had acquired widespread use and provides a reasonably accurate description when dealing with modern curling ice.

To say that a sheet of curling ice is level is, in the first instance, a colloquialism. Technicians add to that many other descriptions like flat, smooth, even, consistent and perfectly level. The purpose of this report is to clarify both the language and the science, without digging too deep into dictionaries.

Definitions

The following comes from good dictionaries commonly available, also on the Internet.

level

= horizontal condition; *especially*: equilibrium of a fluid marked by a horizontal surface of even altitude
<water seeks its own *level*>

= a flat, horizontal surface

= being on a horizontal plane

flat

= having a continuous horizontal surface; being or characterised by a horizontal line or tracing without peaks or depressions

= having a horizontal surface without a slope, tilt or curvature; having a smooth, even, level surface

smooth

= having a surface free from irregularities, roughness, or projections; even

= having a continuous, even surface

even

= having a horizontal surface

It is clear that there are many different ways of describing what is a level ice pad without any irregularities that could, and probably would, affect a curling stone travelling down the sheet. After an email from Art, who makes some accurate observations, the following should be added to the definitions:

"My understanding of 'level' as commonly used in our world, is that it means: perpendicular (or exactly tangential) to the direction of the force of gravity at that particular point."

He continues: "As such, the ideal ice pad would in fact follow the curvature of the earth (neglecting local gravitational anomalies). That is the only way that a stone would, everywhere on the sheet, be pulled by gravity exactly perpendicular to the pad and without any sideways/lengthways bias."

This might seem obvious, but it does not yet answer all the questions and problems that curling-ice technicians face when trying to create the perfect ice surface.

Instruments

A spirit level measures the level between two points within reach of its size, never mind anything between those two points. A laser level measures differences in level over a given area within reach of its transmitter and receiver, and only within an accuracy of 1mm – in a curling rink this area will be somewhere between 1000m² and 2000m². The IcePOD measures differences in level over a distance of 5m, within an accuracy of 0.01mm. None of these instruments can however measure if the surface is truly flat, smooth, even or consistent.

As Art says: "The IcePOD device measures 'straight', not 'level' (a laser 'level' actually displays 'straight' over some distance, and 'level' at its immediate location). It does not matter how STRAIGHT the ice pad is, however, if the pull of gravity is not EXACTLY PERPENDICULAR to it, at every spot."

Conclusion

It is fortunate that none of this really matters to a curling-ice technician, except to refine definition. Everyone can imagine horizontal and see the curve on the horizon, and everyone can see that the floor of a curling rink is flat, or not flat. The essence lies in scale, as Art tells us:

"Within a 30m distance the curvature of the earth is less than a measurable amount, approximately the third decimal of a millimetre. So the use of devices that measure 'straight' (such as the IcePOD or a laser level) may be justified, provided they are starting from a 'level' source."

So it doesn't really matter to us when we speak of level. What does matter is that the ice pad should be level over its area (and water will eventually establish that), it must be flat and smooth, and it must be consistent. It is the consistency that will prove the biggest challenge because of irregularities within the water and refrigeration, combined with influences from above by heat, air or players. As far as we know anything consistently level within 0.05mm over 5m will be sufficiently level for championship curling, and that we can measure with confidence.

*John Minnaar
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With special thanks to Art*