

I. M. R.

Ice-rink Manufacturing & Rental



PRESENTS



TEMPORARY ICE RINKS

we deliver

SATELLITE ICE :

Who is Satellite Ice ?

Satellite Ice been manufacturing and renting ice rinks for over ten years.

Satellite Ice supplies rinks to regular clients throughout Europe.

Satellite Ice has carried out installations in the Middle East (Dubai Summer Surprises) and has successfully kept the rinks operational at temperatures close to 30°C.

The ice rinks are designed and manufactured in-house by SATELLITE ICE in Belgium, which gives the required quality control and flexibility to provide special sizes and shapes to client's requirements.

The 'drive' of SATELLITE ICE makes us who we are and makes it possible to secure continued business relations with all of our main customers. Our best reference is your loyalty.

A few of our references

Numerous cities in the UK, Benelux, France,Ireland and all over Europe.

And our TOP REFERENCES :

UK : Eden Project : Time of Gifts

Dubai : *Ice surprises festival* (july + agust 2002) : Airport exhibition centre

Copenhagen: Launch Opel Zafira for *General Motors Worldwide*

Special Events – Ice shows – Indoor Projects

- Belgian Television show, Antwerp (VRT Ketnet COOL)
- Winter Wonderland On Ice, Sportpaleis, Antwerp.
- United Arab Emirates, Dubai: Ice Show: “Sinbad in the Gulf”

The complete chronological reference list is available upon your simple request!

Satellite Ice is a division of Que Pasa bvba

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DESCRIPTION OF THE ICE-RINK

INTRODUCTION: The Principle:

The principle is very simple. Lots of cooling fluid (similar to anti-freeze) is pumped through pipes at very low temperatures, which in turn freezes any water in contact with them. There are two key issues:

- What the pipes are made of and how well that material conducts heat out of the water.
- How much surface area of the coolant pipes is in contact with the water that needs to become ice.

Most existing rink suppliers use rubber mats with built in capillary tubes to distribute the coolant under the ice. This means that at best only about 0.2m² of each 1.0m² of mat contains fluid that is anywhere near the water above and, more importantly, rubber is a very good insulator against heat transfer.

By contrast, the unique SATELLITE ICE system places a grid of aluminium pipes within the ice, not below it. This provides a cooling surface area of over 1.0m² for every square metre of ice. Even more critical is that aluminium is an incredible 1,800 times better than rubber at transferring heat.

This translates into guaranteed ice at temperatures when rubber-base systems have turned into paddling pools. Our system also offers substantially lower energy bills to maintain the ice. SATELLITE ICE rinks will stay frozen at ambient temperatures up to 28⁰C (82⁰F)

Only by having a full understanding of the physics involved in the heat transfer process can the correct size of chiller be selected. Too small and the ice won't freeze well, too large and the running costs escalate for no good reason at all. Uniquely, all 3 companies taking part in this package have competent engineering personnel who, between them, totally understand all the issues, assuring you of the most efficient and economic installation possible. Energy savings will be at least 35% when compared to rubber based systems.

Not only do we save you money on running costs, our colder ice means you have less down-time.

No SATELLITE ICE rink has ever been late opening or had to close for a day.

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1. The Flooring

Less obvious than the ice, but critical to a successful installation are the strength, quality and insulation properties of the floor beneath the ice and any sub-structure that supports it.

To date none of the suppliers of ice-rinks in the UK have had much experience or knowledge of structural support systems. Many clients have complained of shoddy and sub-standard floor systems, in some cases even built of chipboard which is totally unsuited to the relatively harsh environment of water and freezing temperatures.

Floor systems can vary from a simple insulating layer to a complex structure that levels out sloping ground, bridges flower beds etc. These can be supplied by the client or by one of SATELLITE ICE's preferred suppliers.

The sub-structure has to meet all the loading requirements of a public assembly area, plus the not inconsiderable weight of the ice, whilst being totally level for the initial application of water to the system. A number of optional extras are available, including:

- Stair and ramp access points
- Support towers for audio, lighting and branding
- Wheelchair user viewing areas.

Full documentation covering every aspect of the installation is available immediately to clients.

A water-level floor is imperative to build an ice-rink, otherwise one side of the rink will have very thick ice and the other side none. If the inclination of the floor is limited to 50 centimetres, a standard wooden floor may be used. If the inclination is above 50 cm, a platform scaffolding structure is recommended.

2. The Chiller Unit

For an ice-rink in open air in a moderate climate, we require +/- 250 W/m² effective cooling power. For an ice rink in a warmer climate, we need minimum 300 W/m² with a maximum ambient temperature of 35°C (no direct sunlight on the ice).

E.g. : An ice-rink of 600 m² requires 600m² x 250W/m² = 150 kW effective cooling power. Please note that the electrical power is not the same as effective cooling power.

You can always receive a complete technical guide of the required cooling group.

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3. The Cooling Floor

The cooling floor consists of an insulating layer, a grid of aluminium tubes for the distribution of the cooling fluid + a set of collecting pipes and the cooling fluid itself. The grid of aluminium pipes is placed within the ice, and not under it, so that the total cooling surface area is used to transfer energy, and not only the upper part.

Insulator

The insulator (foam) protects the underground and minimises the energy loss.

Collecting pipes

Two galvanised steel collecting pipes (in + out) are installed at the short end of the rink. These pipes receive the cooling fluid from the chiller through flexible hoses and disperse it to the tubular system. Couplings are of the type Camlok or Bauer.

Tubular system

Large frames of aluminium tubes cover the whole surface of the rink and are interconnected through small flexible industrial hoses. Thus we create an aluminium 'carpet', through which the cooling fluid flows.

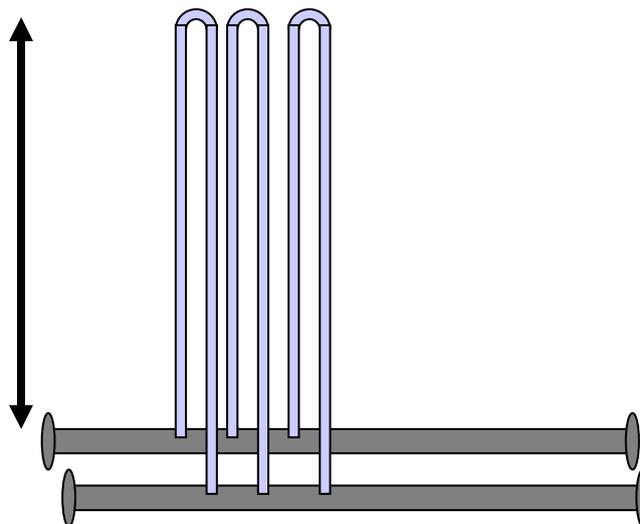
As the sole manufacturer in the world, SATELLITE ICE chooses to work with aluminium instead of rubber. Why we made this choice is explained in detail in annex 1.

Important to remember is that the use of aluminium guaranties dry ice, even in warmer climates. While the rubber carpets lose their efficiency dramatically around 14°C, aluminium goes up to 30°C and even higher.

Few figures:

- Surface area of one frame of aluminium tubes = 5,5 m²
- Per 100 m² ice, +/- 2 km aluminium tubes are used
- Aluminium: EM 6060 Belgian product

Tubular system



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Cooling fluid

Commercial refrigeration plants typically used fluids that were CFC based, leading to ozone depletion if accidentally released, or ethylene glycol mixtures, similar to anti-freeze. CFC's are now (quite rightly) banned from use. Ethylene glycol based fluids are corrosive and cannot be discharged into public drains although they are quite cheap.

Consequently we only use a mixture of water and a synthetic chemical known as MPG (Mono Propylene Glycol). This is a non-corrosive mixture that is totally harmless and is used in the food processing industry. The chiller cools this product to temperatures down to -12°C . By regulating the temperature of the mixture, the thickness and quality of the ice can be controlled to perfection.

Due to the high cost of the fluid, we recover as much of it as possible, although inevitably there is some loss during dismantling. Any fluid lost on site can be safely washed into storm drains. If spilt onto grass, tarmac or other common surfaces it does not affect them in any way. (see technical sheets)



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4. Boarding: the rink “crash Fence”

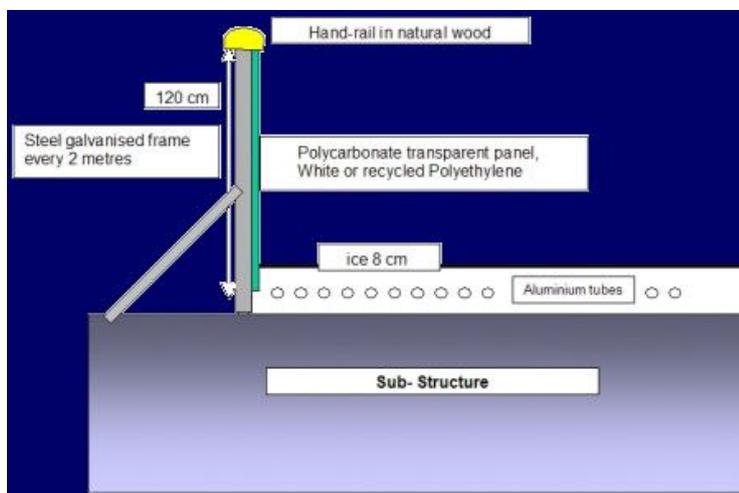
This has a critical safety function whilst affecting the aesthetics. Any ice rink open to the public will be used by people with a wide range of abilities. For those who are not totally in control, an efficient and safe 'crash' fence around the rink is essential. Whilst we can supply ice rinks for professional displays without such safety protection, the provision is mandatory for all rinks to be used by the public.

The 'Dasher Boards' are installed by our crews and we inspect them carefully before signing them off as safe. To achieve adequate levels of protection, it is essential to cover the fences in a solid material that will withstand impacts. Older style fences faced in plywood have been phased out in favour of high strength plastics. These are totally impervious to the water and low temperatures encountered in this environment.

We offer a choice of materials. The standard covering included in all our rink packages is made of recycled plastics, and comes in a natural finish, which is a very pale green in colour. Although an excellent material in terms of impact resistance and environmental acceptability, it is not particularly suited to the application of graphics. We are pleased to offer advice on this.

We can also offer a high gloss white polyethylene boarding, which looks superb and is particularly suited to the application of vinyl graphics. There is an additional cost for this surface. Both of these surfaces can be applied to both sides of the fence. It is possible to mix and match as required.

Finally we can supply a 'glass clear' polycarbonate panel that also meets all of the impact requirements. It is particularly suited to viewing areas that may be used by small children.



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5. Skates

Skates are a critical item of course. SATELLITE ICE has used its many years of experience to put together packages of skates, in various sizes, to suit each size of rink. They are the easy fit 'ski-boot' type. Under no circumstances should you get involved with lace up skates, they take too long to fit and are prone to damage.

All our skates are buckle fastening ski pattern. Every skate we supply is freshly sharpened before each hire.

Ice rink managers often create temporary shelving units, depending on the storage facilities

Our standard recommended skate package is based on the size of the rink and the maximum capacity. Sizes are mixed based on experience. Statistically it is prudent to have more skates for the smaller rinks.

6. Cleaning of the rink

Various options are available. From mechanical cleaning with a Zamboni type machine for the bigger rinks, to manual cleaning scrapers for smaller rinks.

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Annex 1

Why aluminium tubes and not rubber pipes

To turn water into ice, an intermediate cooling fluid is needed to chill the water until it freezes. Therefore we need some kind of heat transfer.

Heat transfer = if two substances of a different temperature are brought into contact with each other, both will eventually come to the same temperature. Heat will be transferred and the warmest substance will become cooler.

When making ice, the warmer water will cool down until it reaches the temperature of the cooling fluid, which is far below zero, and thus will have turned into ice.

Physics tells us that :

- Turning water into ice requires exceptionally much heat
- The material of the cooling floor is very important in this process.

1/ Water → ice

Water first cools down to 0°C, and will then be turned completely into ice of 0°C before it can cool down any further.

Interesting fact :

The heat transfer for water of 0°C to turn into ice of 0°C is the same as the amount required to heat water of 0°C to 80°C.

2/ Material of the Cooling Floor

Heat must be transferred between the warm water and the cold cooling fluid through the pipes of the cooling floor. The material of which these pipes are made determines whether this will be easy or not. An indication of how easy or how difficult this will be can be found in the “Thermal Conduction Coefficient” .

If this figure is smaller than 1, the material is a ‘heat-insulator’ and the process will be hard.

If this figure is larger than 1, the material is a ‘heat-conductor’ and the process will be easy.

Material	Thermal Conduction Coefficient
Air	0,024
Rubber	0,13 à 0,14
Aluminium	237
Silver	429

Conclusion :

Aluminium is approximately 1800 times more efficient to build an ice-rink than rubber.

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