

## Design of the Ice Rink of the Future

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**Abstract :** Today's ice rinks are important energy consumers for the production and maintenance of ice. At the same time, users demand that the other rooms should be tempered or heated. The building complex must equally provide cooled and heated zones, which does not translate as carbon-zero ice rinks. The study provides an analysis of how the civil engineering sector can significantly impact minimizing greenhouse gas emissions and optimizing synergies across an entire ice rink complex. The analysis focused on three distinct aspects: the layout, including the volumetric layout of the premises present in an ice rink; the materials chosen that can potentially use the most ecological structural approach; and the construction methods based on innovative solutions to reduce carbon footprint. The first aspect shows that the organization of the interior volumes and defining the shape of the rink play a significant role. Its layout makes the use and operation of the premises as efficient as possible, thanks to the differentiation between heated and cooled volumes while optimising heat loss between the different rooms. The sprayed concrete method, which is still little known, proves that it is possible to achieve the strength of traditional concrete for the structural aspect of the load-bearing and non-load-bearing walls of the ice rink by using materials excavated from the construction site and providing a more ecological and sustainable solution. The installation of an empty sanitary space underneath the ice floor, making it independent of the rest of the structure, provides a natural insulating layer, preventing the transfer of cold to the rest of the structure and reducing energy losses. The addition of active pipes as part of the foundation of the ice floor, coupled with a suitable system, gives warmth in the winter and storage in the summer; this is all possible thanks to the natural heat in the ground. In conclusion, this study provides construction recommendations for future ice rinks with a significantly reduced energy demand, using some simple preliminary design concepts. By optimizing the layout, materials, and construction methods of ice rinks, the civil engineering sector can play a key role in reducing greenhouse gas emissions and promoting sustainability.

**Keywords :** climate change, energy optimization, green building, sustainability

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