AXTER

ACOUSTIC ADVISORY NOTE 4 AA/BG/061298-01

ICE RINKS

WHY DO WE NEED TO CONTROL NOISE IN ICE RINKS?

Indoor covered ice rinks are usually high-volume but fairly empty areas where the majority of the internal surfaces are extremely reflective, e.g. the ice surface itself, the glazing and concrete walls.

The lack of acoustic protection means that such spaces can be extremely noisy and can lead to reverberation times of more than 5 seconds.

During teaching sessions or sporting occasions, there will be increased noise levels from participants, the audience and from whistles. Ability to hear the spoken word will be poor and the general hubbub will cause fatigue amongst the teachers and participants. Furthermore The Noise at Work Regulations 1989 require action to be taken where the noise level $L_{EP,d} \geq 85$ dB(A).

For these reasons acoustic control must be considered at the design stage of a building.

CONTROLLING NOISE

INTERNAL CORRECTION

This concerns the internal comfort of the ice rink.

There is no specific legislation relating to ice rinks. Swimming pools are the nearest similar type of construction in terms of usage, for which, in France, the maximum reverberation times are defined as:

Tr = 0.13 $(V)^{1/3}$ for low frequencies (125 and 250 Hz)

Tr = 0.10 $(V)^{1/3}$ for average and high frequencies (500 to 4000 Hz)

V (in m^3) is the volume of the ice rink.

For example, a building 70 m long x 50 m wide x 12 m high would require a max. Tr of 4.55 sec. at 125 and 250 Hz and 3.5 seconds at higher frequencies.

These are only guideline figures for rectangular buildings. Because reverberation time is determined by the shape and composition of the internal surfaces it is recommended that an acoustic analysis is undertaken using computer simulation techniques; it is impossible to make general observations as to the requirements in these premises.

INSULATION WITH RESPECT TO THE EXTERNAL ENVIRONMENT

This concerns the transmission of noise from the inside to the outside of the building and vice versa. Department for Education guidelines recommend a maximum background noise level from adjacent areas, ventilation and traffic noise ($LA_{eq,8hr}$) of 50 and minimum insulation between similar rooms (D_w(dB)) of 33. Local planning requirements are likely to further limit the amount of sound escaping from the building in order to protect people living nearby.

Such characteristics depend upon the type of materials used in the building's construction and the distance from its neighbours.

The performance of a roof or wall is limited by weak points (doors, windows, ducts, chimneys, etc....) and therefore specifying even the highest quality cladding could prove to be a futile exercise. (A concrete wall one metre thick will be completely ineffective if the doors and windows are left open).

An acoustic analysis will identify the optimum achievable performance and the most suitable materials to be specified.

ESSENTIAL INFORMATION REQUIRED FOR AN ACOUSTIC ANALYSIS

Internal Correction

- plans and sections showing the internal layout of the premises
- type and composition of the internal surfaces - walls, floor and roof
- report on any previous acoustic studies
- type of treatment envisaged and possible location
- any specific aesthetic requirements

Insulation with respect to the exterior of the building

- plans and sections showing the building layout and its environment
- type and composition of all external surfaces - doors, windows, walls, ventilation units...
- report on any measures already undertaken or previous acoustic studies
- any specific aesthetic requirements

MATERIAL CHARACTERISTICS

The materials to be used in the construction must:

- be as absorbent as possible, especially at frequencies of 500 to 2000 Hz which is the level of children's shouts
- be non-combustible
- be designed to eliminate the problems caused by condensation

Priority:

Because of its large surface area, treatment of the roof or ceiling is vital. However control of the ceiling alone will be insufficient and treatment of the cladding near the roof junction and at all internal wall angles will also be required.

SOLUTIONS FROM AXTER

Internal correction

The following roofing systems meet the conditions commonly required in ice rinks:

Roof:	AQUALPHA SUPER ALPHA ANTISON
Walls:	ANTISON

For premises with high levels of humidity AQUALPHA should be used.

Internal correction + insulation

In the majority of cases the above named systems are sufficient. However in certain more severe cases, THERMOSON A must be used for the roof and THERMOSON A or B for the cladding.

EXAMPLE

OLYMPIC ICE RINK, ALBERTVILLE, FRANCE

Composition of the interior:

- Roof — AXTER's **SUPER ALPHA** roof system (7000 m^2).
- Walls — Double skin metal cladding (6000 m^2) + terracing + masonry
- Floor — Ice and concrete

History:

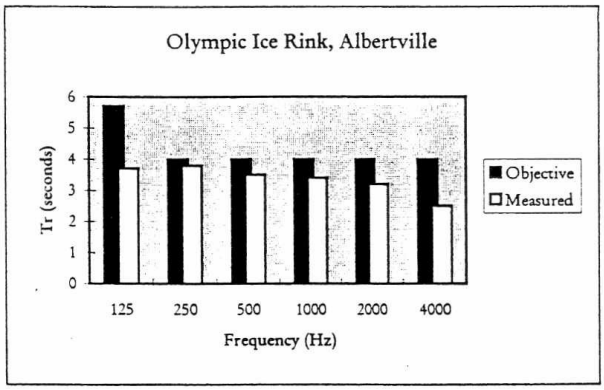
In 1988 the Albertville Town Council launched a Design & Build competition for a new ice rink which would become the central focus for the ice competitions during the 1992 Winter Olympics. The contract was awarded to a team who were to be responsible for the design and construction of the project. In this particular case the sound reduction index (SRI) of the chosen system had to be sufficient to protect the interior from aircraft noise flying nearby.

The design of the building posed a difficult question for noise control because the construction called for external supporting steel work which would penetrate the roof and wall coverings at many points. This required workmanship of the highest order to avoid sound breakout at these points as well as making the roof watertight.

AXTER's **SUPER ALPHA** was chosen as the most appropriate roof specification combining both the required level of sound insulation and absorption.

Results:

The sound insulation more than met the requirements and the reverberation time Tr was measured. The histogram below shows the actual results with the objectives as laid down by the Olympic Games Organising Committee.



The objectives were respected and the Olympic Games skating competitions took place in the best conditions.

Bibliography

1. Noise at Work Regulations 1989
2. Templeton, D W and Saunders D - Acoustic Design - Architectural Press
3. Department for Education - Building Bulletin 51 (draft) - Acoustics in Education Buildings

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