Acoustics in Sports Facilities

Solutions to acoustic problems in sports facilities

Sports Facilities such as sports halls and gymnasiums are large open spaces built to withstand years of use for a variety of sports. They are built with hard wall, floor and ceiling surfaces making them particularly poor acoustically. These spaces are often used for a variety of activities making their acoustic performance important in order to facilitate clear communication and provide an enjoyable atmosphere whether the activity is a school assembly or one of the many sports which are carried out in these environments.

Building Bulletin 93

As there is an increased awareness of the importance of exercise to health, there has been a big increase in the number of people attending sports activities. This has lead to an explosion in sports building needs and has resulted in the construction of new sports facilities around the country by Councils and is encouraged by National Government policies.

Sports England and **Scotland** requires that the mid frequency reverberation time must not exceed 2 seconds in sports halls.

Health and Safety research and concerns by the Education authorities into new schools has resulted in the introduction of legislation to comply with the acoustic requirements. These are laid out in Building Bulletin BB93 and are part of the Building Regulations in the design of not just the sports halls but also classrooms, music rooms, dining halls etc.

The constructional standards for acoustics for new buildings, as given in section 1 of BB93, are required to be achieved under the Building Regulations. Requirement E4 from Part E of Schedule 1 to the Building Regulations 2000 (as amended) states that:

"Each room or other space in a building shall be designed and constructed in such a way that it has the acoustic conditions and the insulation against disturbance by noise appropriate to its intended use."

Requirements for reverberation times are as follows:-

Indoor Sports Hall	< 1.5
Gymnasium	< 1.5
Swimming Pool	< 2.0
Dance Studio	< 1.2
Multi-purpose Halls	< 0.8 -1.2

(Drama, P.E., assembly, occasional music)

Reflection and Sound Absorption

Once emitted from a source, sound waves in a hall travel through the air until they reach a boundary surface or other obstacle. When a sound wave reaches a surface it will be partly reflected off the surface back into the hall and continue travelling in a new direction, and it will be partly absorbed by the surface with the absorbed energy being dissipated as heat. Sports facilities are particularly problematic when it comes to echo and reverberation due to the hard wall, floor and ceiling surfaces which are required to withstand years of use from sporting activities.

Absorption Coefficient

The amount of sound energy that can be absorbed by a surface is given by its absorption coefficient, α.

The absorption coefficient can take values in the range 0 to 1. A surface that absorbs no sound (i.e. a totally reflective surface) has an absorption coefficient of 0 (i.e. 0%) and a surface that absorbs all sound incidents upon it has an absorption coefficient of 1 (i.e. 100%). Thus the higher the value of α, the more sound will be absorbed. In practice, most surfaces will have values between 0 and 1.

The sound absorption coefficients chart below shows that plastered masonry walls absorb only 2% (sound absorption coefficient of 0.02) of the incident sound and hence reflects 98% of the sound back into the hall. A plastered masonry wall is an excellent reflector of noise!

Typical absorption coefficients at 1,000 Hz mid-frequency range:

Material	Sound absorption Coefficient (α)
Plastered masonry wall	0.02
Glass window	0.03
Timber door	0.08
Lino floor covering on concrete	0.05
Plasterboard ceiling	0.05
Carpet on concrete floor	0.10
WoodsorbaPro acoustic panels	**0.96**
Wallsorba acoustic wall panels	**0.96**
Echosorba II acoustic panels	**1.00**

In contrast, the **Woodsorba**Pro timber acoustic panels absorb 96% (sound absorption coefficient of 0.96) of the incident sound hence reflects only 4% of the sound back into the hall. Therefore the Woodsorba Pro timber acoustic panels are excellent absorbers of noise.

SOUNDSORBA®
ACOUSTIC PRODUCTS

Why are sports facilities acoustically bad?

Sports halls, gymnasia and especially swimming pools have long reverberation times through the nature of their construction and surfaces necessary to their function. One of the prime requirements of the internal surfaces of sports facilities is that they are strong and durable. To this end, the internal wall surfaces typically comprise of painted high density block work, brickwork or timber cladding.

The floors are invariably timber sprung to allow a variety of sports activities such as indoor football, badminton, aerobics etc.

The ceilings are generally metal cladding, concrete, plasterboard or solid timber boarding. All these are hard surfaces. When sound hits these hard surfaces, it bounces back into the hall and this results in high noise levels and poor speech intelligibility.

Long reverberation times also increase the reverberant noise levels within halls, which further decrease speech intelligibility. To compensate for this, in reverberant halls people tend to increase their voice levels to make themselves heard over the reverberant noise, which further exacerbates the situation.This is a common feature of many sports halls.

Poor acoustic conditions in these environments make it difficult to communicate. Fitness instructors, Physical education teachers and other professionals find it difficult to cope with the high noise levels which can lead to voice problems due to prolonged use of the voice and the need to shout to keep control. It is important to have good acoustics in these areas not only for staff but also for users so they can enjoy their activities without distraction.

If there are large areas of acoustically hard parallel surfaces, flutter echoes can occur, significantly increasing the reverberation time and reducing speech intelligibility. A reasonable distribution of acoustic absorption panels will eliminate this effect.

Varieties of relatively rigid and robust acoustically absorbent panels are available and can be used. In general these products are used on high level walls and ceiling surfaces.

Demonstrating compliance to the client

To ensure that acoustic performance standards are met, it is recommended that the designer or builder contacts Soundsorba Ltd for technical advice.

Soundsorba Ltd can provide design calculations in order to specify the correct product for that particular area, depending on the application. We can assess and analyse the existing acoustic problems in the hall and devise the most cost effective remedial treatment scheme to make the hall comply with the relevant Standards.

It is better for the designer or builder to ask for technical advice at the design stage of a project rather then when the project has been built and the acoustic problems become apparent. It is then more costly to install acoustic treatment as a retrofit.

Solutions to acoustic problems in sports facilities

WOODSORBAPRO™ Timber Acoustic Panels

The WOODSORBAPRO range of timber acoustic panels has been developed to provide an impact resistant and aesthetic solution to noise control. These panels are visually attractive due to the beauty of wood veneers and they also offer the advantage of being installation friendly.

The panels decorate with a broad range of available finishes as well as providing a solution to the high reverberant noise levels found in sports halls, gymnasiums, multi purpose halls and other areas where hard durable finishes on the walls and ceilings are required.

WOODSORBAPRO timber acoustic panels provide an ideal solution to noise control in sports halls due to their ability to withstand high impact and resist damage. They can be easily installed to both wall and ceiling surfaces.

WOODSORBAPRO timber acoustic panels are available in a wide range of real wood veneers and also paper laminate finishes, two standard paint finishes are also available, white and grey, however other colours are available on request

WALLSORBA™ Acoustic Wall Panels

WALLSORBA acoustic wall panels can be used to line the walls at high level, normally from the door head upwards.

WALLSORBA acoustic panels are robust to withstand impact from objects such as indoor footballs. They are supplied pre decorated with a wide choice of colours and can help to achieve a reverberation time of less than 1.5 seconds which is required for sports halls in schools and is also suitable for other sports facilities.

WALLSORBA acoustic wall panels create a soft look and provide a comfortable environment by controlling noise levels. They maintain the level of durability required whilst decorating with a choice of fabric colour to suit any hall. A variety of these products are available and have been designed for easy installation.

ECHOSORBA II™ Acoustic Ceiling Panels

ECHOSORBA II acoustic ceiling panels are extremely high performance noise absorbers. These panels are installed where they will not be hit and also out of reach of people's hands. They are suitable for use in many areas including sports facilities as they provide the acoustic absorbency which is required as the reverberation time should not exceed two seconds at mid-frequency according to Sports England and Scotland.

It is advisable in most sports facilities not to use suspended ceilings; these are inappropriate especially for sports halls as the ceiling must be secure and remain undamaged if it is hit during sports activities by balls etc.

ECHOSORBA II acoustic panels can simply be adhered to the ceiling surface and easily cut to size or around any fixtures or fittings creating a finish which not only looks visually attractive but will not harbour dust and will allow for the requirements of any lighting system. They are supplied in white as standard to blend with most ceilings, however they can be emulsion painted to any colour with little significant effect on the acoustic performance.

References

Soundsorba Acoustic Panels have been used in Sports facilities throughout the United Kingdom.

A few are listed below:-

- Crawley Leisure Centre – Crawley
- Kingston Grammar School – London
- Darwin Health Centre – Darwin
- Bridport Youth Centre – Penrith
- St Luke's School – Exeter
- Weavers Sports Centre – Wellingborough
- Bramford School – Dudley
- Sutton Leisure Centre – St Helens
- St Katherine's School – Knockholt
- Tor Leisure Centre – Glastonbury
- Eastwood Community Centre – Winchester
- University College – Cork
- Eden Sports Centre – Penrith
- R.A.F Flyingdales – Pickering
- Lest Valley Sports hall – Stockbridge
- University of Liverpool – Liverpool
- Sulhamstead Police Training College – Theale
- Headington School – Oxford
- Heigham Park School - Norwich

Other areas of application of Soundsorba products:

- Offices
- Music rooms
- Studios
- Classrooms
- Theatres
- Lecture Rooms
- Cinemas
- Conference Rooms
- Hearing Test Rooms
- Computer Rooms
- Workshops
- Village Halls
- Firing Ranges
- Training Rooms
- Police Interview Rooms

Soundsorba's technical department will be pleased to assist with sound absorption solutions and acoustic problems in sports buildings.

Please contact us on telephone number **01494 536888** or email us with your noise problem at **info@soundsorba.com** or fax us on **01494 536818.**

Acoustic product details are available immediately on our website which is **www.soundsorba.com**

All information contained in the details is given in good faith but without any warranty

SOUNDSORBA®

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