

Memorandum

Project: Church of the Good Shepherd, Carshalton
Subject: Internal Acoustics
Prepared: Philip Hankin
Date: 12 December 2019
Reference: 19/0633/M1 **Revision:** 0 **Approved:** BHolc

1 Introduction

The existing church space has been the subject of a recent cosmetic refurbishment, part of the refurbishment involved the removal of fabric banners hung from the walls.

Although there have been comments in the past in respect of the internal acoustics of the church, there have been some made recently since the refurbishment. While the removal of the banners is not likely to have made a significant difference given the size of the space, it may be that it has acted as a catalyst for comment to be made.

Cole Jarman were asked to inspect the premises, measure the existing internal acoustic conditions, and provide realistic options for improving these.

2 Design Guidance

The reverberation time of a space is the key descriptor of the acoustic conditions within the church, defined as the time it takes for sound to decay by 60dB from an initial measured level, once the sound source is switched off.

Rooms which have too long a reverberation time can sound noisy and unpleasant; the lack of absorptive material allows sound to build up to a higher level than in a room with a comparatively greater amount of absorptive finishes. This also has the effect of reducing the intelligibility of speech, as words from a person speaking are confused by reflections of earlier words spoken.

The Department for Education document Building Bulletin 93¹ contains guidance on recommended acoustic conditions within different spaces within schools. Table 6 suggests reverberation time limits set in terms of T_{mf} mid frequency reverberation times, this is the

¹ BB93: acoustic design of schools - performance standards



Internal Acoustics

average of the measured reverberation time in the 500Hz, 1kHz and 2kHz octave bands where the vast majority of information in speech is carried.

The following specific guidance is offered:

- *New Build*; assembly or multi-purpose hall (drama, assembly, occ. music) T_{mf} 0.8-1.2secs.
- *Refurbishment*; assembly or multi-purpose hall (drama, assembly, occ. music) T_{mf} 0.8-1.5secs.

Further guidance can be found in the document "Acoustics of worship spaces" (Acoustical Society of America 1983), this considers different types of worship spaces and suggests the following:

- Intimate meeting house style church 0.8-1.2 seconds.
- Evangelical style of church with greater emphasis on amplified speech and music 1.0-1.5 seconds.

As speech intelligibility is on balance the more important requirement than enhanced musical performance, one could be led to conclude that the lower end of this range would be preferable, however the church has a very large internal volume and there are practical and cost limitations as to how much treatment can be added to the surfaces within the space.

Considering the guidance and limitations, we would suggest that a reverberation time target of around T_{mf} 1.5 seconds be set for the church, considering that the optimum reverberation time would be considered to lie in the range 1.2-1.5 seconds. The balance between optimal musical and speech conditions always involves some form of compromise.

3 Test of Existing Conditions

The existing reverberation times were measured as an average across the space, using a starting pistol to provide impulsive excitation to the space. The results of the measurements are presented in the attached figure 19/0633/F1.

The measured reverberation time of T_{mf} 2.29 seconds is significantly above the suggested criterion of 1.5 seconds and explains the problems that some users of the space have been having.

A simple clapping test revealed no noticeable flutter echo, which can further cause issues of speech intelligibility. Flutter echo is a rapid repeated reflection of sound between parallel surfaces, in this instance there is enough variation and features in the side walls to prevent this effect from occurring to a noticeable level.

In order to reduce the reverberation time, some absorptive treatment needs to be introduced to the space, such treatments are surface mounted and usually comprise a fibrous material such as semi-rigid mineral wool or fibreglass covered with a decorative fabric or perforated solid metal surface.



Internal Acoustics

We have considered a typical surface treatment, a class C absorber (absorbers are rated from E as the worst to A as the best) which are usually sufficient to improve speech conditions in such situations. A class A absorber offers improved low frequency absorption, but are usually much thicker and more expensive as a result.

The absorber has the following characteristics:

Column Title	Absorption Coefficient (α)					
	@ Octave Band Centre Frequency (Hz)					
	125	250	500	1k	2k	4k
25mm Class C absorber panel	0.1	0.4	0.9	0.95	0.95	0.95

T1 Required absorption coefficient of surface acoustic treatment

We have assessed the effect of introducing different quantities of material into the space as follows:

- 60m² of panels: T_{mf} reduced to 1.53 seconds
- 100m² of panels: T_{mf} reduced to 1.26 seconds

The results of the calculations are also presented on figure F1. The results show how when treating a large volume space such as this with limited absorption, initially the addition of panels has a significant effect, however a point is reached of diminishing returns, where further benefit of adding significantly more panels is limited. In this instance adding 40m² more panels to take the total area to 100m² only brings a further 0.25 second reduction in reverberation time.

In this situation we would expect that a reduction in the reverberation time of around T_{mf} 0.8 seconds as achieved by adding around 60m² of panels seconds would be a very noticeable reduction, providing significant benefit to the church occupants. Further treatment, aside from being expensive and increasingly difficult to accommodate without covering excessive wall area with treatment, may be perceived as taking the reverberation time too low.

In such instances people tend to have particular opinions, some will like a very dry acoustic with short reverberation times, while others prefer a modicum of reverberation to remain for the benefit of music performance. We consider the target aim of T_{mf} reduced to 1.5 seconds to strike the right balance between musical and speech performance.

The attached Appendix A provides a guide as to potential class C treatments available, however we have successfully used 25mm deep fabric covered panels manufactured by Soundsorba elsewhere (a product sheet is attached). These were used successfully at River Church, Sutton and we were able to help them negotiate a healthy discount on the cost of these.

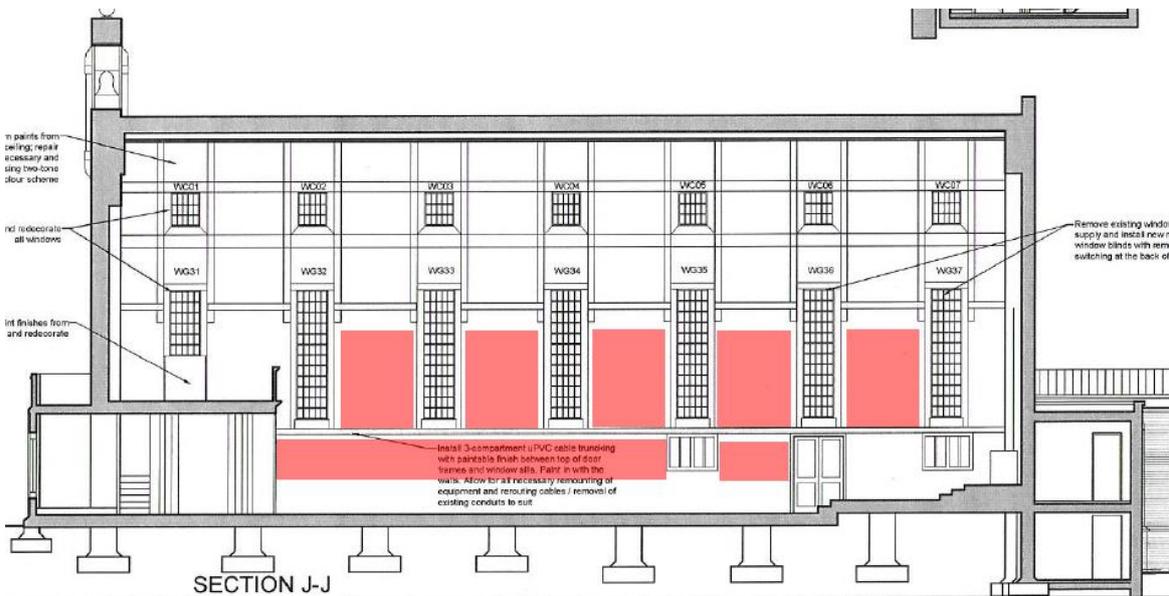


Internal Acoustics

Such panels can be installed by a competent tradesman, without the need for a specialised installation company. Whichever treatment is utilised, the key is that it meets the performance set out in table T1, we can review alternative performance figures for any other products you wish to consider.

In terms of location, due to the size of the space and the location of the PA loudspeakers and band, we would not recommend applying treatment to the ceiling, as that is too far away to gain the full benefit and a greater area of treatment may be required if the panels were to be located there.

Instead, we would recommend that the treatment be applied to the plain wall area in between the side windows and in a strip along the side walls. The sidewall treatment should start at dado rail height around 1.2m above the floor and run up to the ledge below the window bases.



The treatment should be placed in the main side areas next to the congregation to maximise the local improvement of conditions where people sit, there is some benefit to leaving the front of the church clear to aid reflection of sounds off the front walls back to the congregation. The specific areas of each panel group and detail locations would need to be determined by measurements on site (by others).

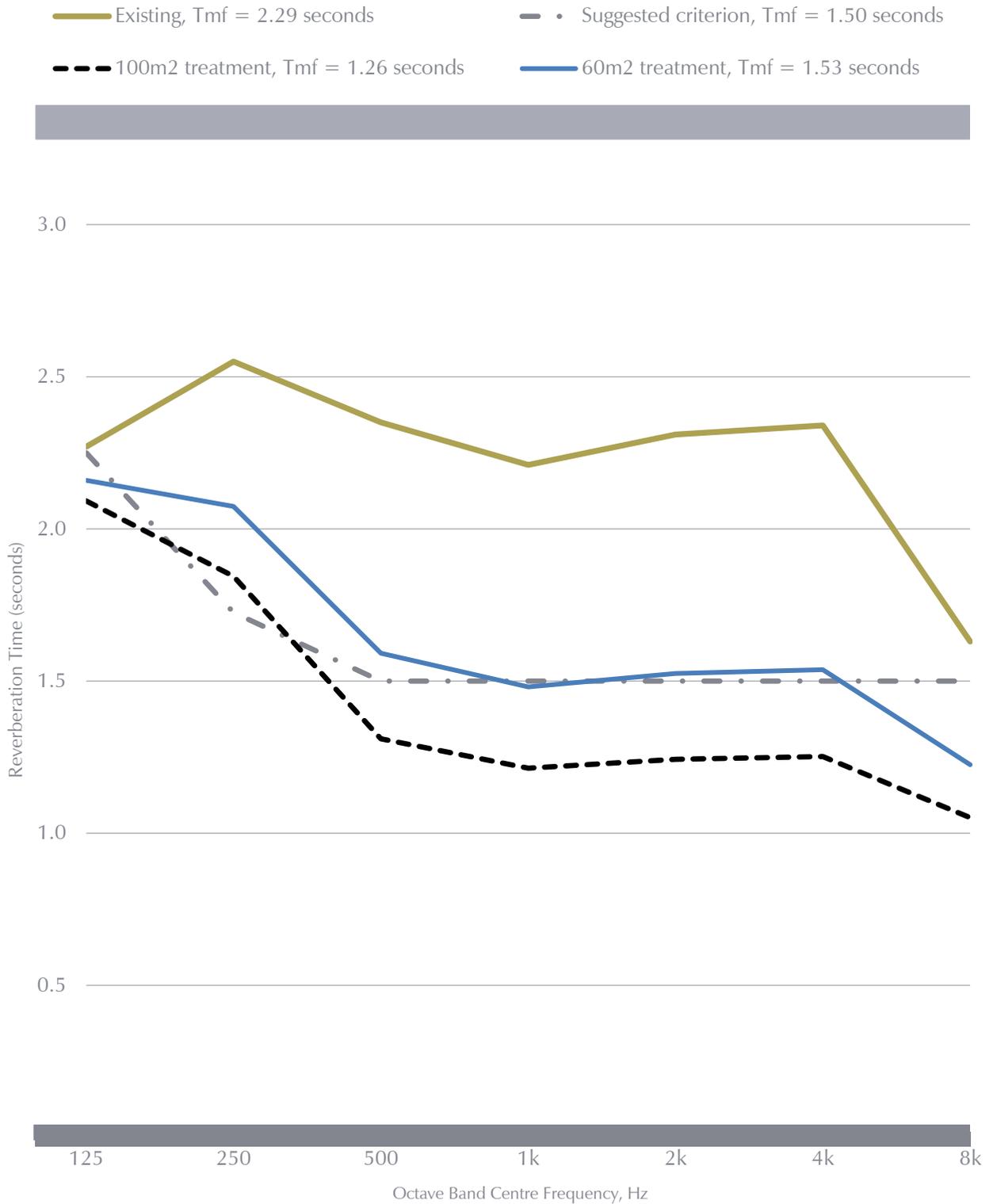
The important point is not to cover the treatment up with decoration or other objects so that it remains exposed to sound within the space. The panels we have suggested are available in a range of colours and fabrics, more expensive variants from other companies can be printed with graphics if required.

■ End of Section



Figure 19/0633/F1

Church of the Good Shepherd, Carshalton - Octave Band Reverberation Times



Appendix A

Subject: Sound absorptive material treatments
Project: Church of the Good Shepherd, Carshalton
Date: 12 December 2019 **Prepared: PH**
Revision: 0 **Approved: B Holc**

A1 Introduction

This appendix sets out products of an example selection sound absorbent materials which might be considered appropriate in an worship environment. Products are grouped into sound absorptive classifications, where Class A provides the highest performance. Section A3 sets out the minimum sound absorption performance expected for materials in each Class.

Section A2 provides an introduction to acoustic theory which is relevant to the selection and application of the absorbent materials presented in this appendix.

Section A8 sets out other sound absorbent materials, the application of which are not easily described in terms of surface coverage, but may equally be utilised as part of a sound absorptive treatment strategy.

These examples are intended to provide an indication of the type of products available, and it is recommended to be used on only as a guide. Similar products by other manufacturers may offer equivalent alternatives. Also manufacturers offer a range of products that can offer different sound absorption performance according to the extent of perforation, depth, mounting condition and surface finish. Therefore, the absorption class for the actual materials proposed must be established and checked before final selection.

Example supplier contact details are provided in the final section A9.

A2 Reverberation control

Reverberation time (RT) is the most commonly used descriptor of acoustic quantity. Simply stated, it is the time taken for an impulsive sound (such as a hand clap) to decay by 60dB.

The reverberation time is dependent upon the rate of removal of sound energy from that room. Acoustic theory discusses the concept of a room whereby all surfaces are perfectly acoustically reflecting, such that all sound energy is retained within the room except for an open window where sound energy may freely escape never to return. In this concept the rate



Sound absorptive material treatments

of decay of sound energy is therefore dependent upon the open area of the window. If no window was present, then a sound generated within the room would never decay.

In real rooms, however, all materials will absorb and reflect sound to vary degrees, by varying processes and with varying frequency characteristics. If an open window is described as having an absorption coefficient of 1.0, and a concrete surface is described as having an absorption coefficient of zero, then a thick pile carpet at 1kHz would have an absorption coefficient of about 0.6.

To achieve a desired reverberation time within a room, therefore, it is necessary to introduce sound absorptive materials equivalent to the necessary area of “open window”. For materials which are very sound absorbing a coverage similar to the “open window” would be sufficient. For materials which are less sound absorbing a greater area of coverage would be required. Clearly, since all materials provide some sound absorption, a holistic approach to the material finishes in a room is typically required to specify the correct amount of sound absorptive material.

Different materials offer different levels of absorption according to sound frequency. For most materials selected for their sound absorption properties they will offer lower sound absorption at low frequencies than at high frequencies.

A3 Minimum performance

Materials in Class A, B, C and D would be expected to achieve in each octave band no less than the following sound absorption performance.

Absorption Class	Sound Absorption Coefficient (α) at Octave Band Centred Frequency (Hz)					
	125	250	500	1k	2k	4k
Class A	0.20	0.65	0.90	0.85	0.90	0.80
Class B	0.15	0.55	0.75	0.80	0.80	0.70
Class C	0.10	0.35	0.60	0.60	0.60	0.50
Class D	0.05	0.10	0.35	0.40	0.30	0.20

It is noted that the minimum sound absorption performance provided above is beyond that otherwise described in EN ISO 11654: 1997 for the determination of material sound absorbency classification. We expect 90% of products would achieve in every octave band the sound absorption coefficient associated with their class rating.



Sound absorptive material treatments

A4 Class A materials

A4.1 Mineral fibre ceiling tiles

- Lay in grid, or similar ceiling tiles. Not all tiles achieve the same acoustic performance, but for the same aesthetic Class A can be achieved.
- The higher performance typically requires a reasonable air space behind the tile and possibly also a blanket of mineral wool laid above.
- Example products include Armstrong 'Nevada', Rockfon 'Sonar' and Ecophon 'Focus'.
- There are a number of products which can achieve Classes B, C and D.



A4.2 Prefabricated mineral wool panels

- These are pre-made mineral wool panels finish with a fabric cover adhered to the exposed surface.
- There are very many products on the market. Suppliers include CMS Acoustics, Decoustics, Ecophon, Eomac, Hodgson and Hodgson, IAC, RPG, Siderise, etc.



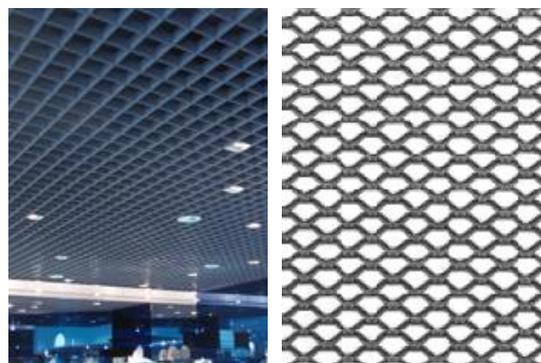
A4.3 Stretched material over sound absorbent core

- Sound absorption is provided by a material hidden behind an otherwise acoustically transparent fabric. The core would most commonly be mineral wool as required.
- Example suppliers include Eomac, Fabritrak and Siderise.



A4.4 Transparent surface over sound absorbent core

- Similar to item A4.3, any material if suitably acoustically transparent may be located over a sound absorbent core to achieve a high sound absorption performance.
- Examples materials include expanded metal (see Cadisch), egg-crate (see 'Celio' by Armstrong) or that by Stretched Ceilings Ltd. (formerly Barrisol).





Sound absorptive material treatments

A5 Class B materials

A5.1 Mineral fibre ceiling tiles

- Lay in grid, or similar ceiling tiles. Again, not all these tiles achieve the same acoustic performance, but for the same aesthetic as the Class A performance can be achieved.
- There are very many products on the market. Suppliers include Armstrong, Knauf AMF, Rockfon, Hodgson and Hodgson, OWA, etc.

A5.2 Perforated metal panels

- Lay in grid or panelled perforated metal ceiling tiles. Sound absorption is provided by the mineral wool located above the ceiling panel.
- Only some metal panel products can achieve Class B performance. There are a number of products which can achieve Class C and D.
- Example products include SAS 'System 130', and Hodgson and Hodgson 'Firesound'.



A5.3 Monolithic treatment over sound absorbent core

- Similar to the above item A4.3 a sound absorbent core is first installed and then an acoustically transparent finish is applied, either by spray or trowel.
- The quality of finish on the final product will significantly affect the overall cost. Lower cost solutions can be very coarse. High cost solutions can appear very nearly like seamless plasterboard.
- The Class B performance requires an airspace behind the treatment.
- Example products include Rockfon 'Mono' and Oscar Acoustics 'Sonacoustic'.



A6 Class C materials

A6.1 Perforated plasterboard

- Perforated plasterboard with mineral wool and an airspace behind.
- Only some perforated plasterboard products can achieve a Class C performance. There are a number of products which can achieve Class D.
- Example products include 'Rigitone' and 'Gyptone' by British Gypsum and 'Apertura' by Knauf AMF.





Sound absorptive material treatments

A6.2 Perforated timber

- Perforated timber with mineral wool and an airspace behind. Not all perforated timber products achieve the same acoustic performance.
- Only some perforated timber products can achieve a Class C performance. There are a number of products which can achieve Class D.
- Example suppliers include Gustafs, Decoustics and RPG.



A6.3 Spray on treatment

- A product which resembles paper mache when complete, the spray finish can be applied with the sound absorptive core in item A5.3. The resulting finish is not as fine, but an apparent monolithic seamless finish can still be achieved if the surface is at a reasonable height.
- The only product we are aware of which is made in this manner is 'Sonaspray' by Oscar Acoustics.

A7 Class D materials

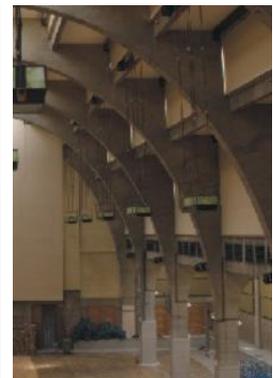
A7.1 Acoustic render

- This is a spray on finish similar to the above item A6.3 but made from a different material. The final product can look similar to the above item A5.3 but with a substantially reduced performance.
- Suppliers include Sto and Pacy & Wheatley.



A6.4 Heavy drapes

- Hung heavy velour drapes can be a very suitable acoustic treatment, and attached to a mechanical track may be installed as operable treatment.
- Suppliers of operable acoustic curtains and drapes include Triple E.





Sound absorptive material treatments

A7.2 Carpet

- Carpet generally should be considered as part of the holistic assessment of sound absorption. However, a

thick pile carpet in particular will provide a significant degree of sound absorption in a room.

- Thick pile carpets are, however, not normally hard wearing and may not be suited to some environments.

A8 Other Materials

A8.1 Sound absorbent light fittings

- These luminaries typically include sections of perforated metal with mineral wool behind.
- These products can form part of a package of sound absorption measures but are generally unlikely to achieve the requirements alone.
- Example products include SAS 'System 600', and Whitecroft 'Foil'.



A8.2 Hanging baffles

- Sound absorptive baffles are typically of the same construction as wall panels (see above A4.2) albeit hung vertically on the ceiling. By utilising hanging material rather than a normal ceiling no saving in total material is typically found, however the soffit may remain exposed.
- Example suppliers include Hodgson and Hodgson, Knauf AMF and Rockfon.





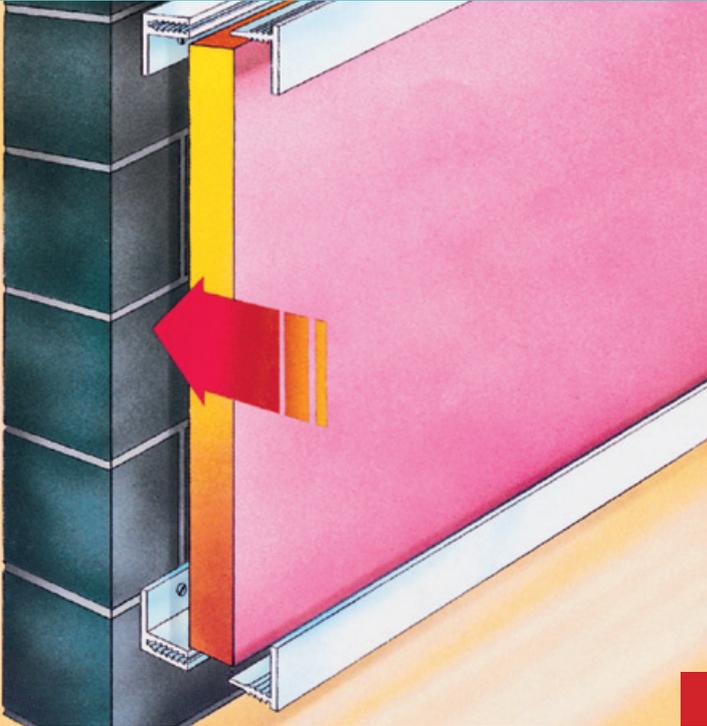
Sound absorptive material treatments

A9 Supplier Contact Details

Supplier	Telephone	Website
Armstrong	0800 371849	www.armstrong-ceilings.co.uk
British Gypsum <ul style="list-style-type: none">'Arteco' perforated plasterboard products	08705 456 12	www.british-gypsum.com
Cadisch MDA Limited <ul style="list-style-type: none">Expanded and perforated metal supplier	020 8492 0444	www.cadisch.com
CMS acoustics	01925 577711	www.cmsacoustics.co.uk
Decoustics Limited	01223 257701	www.decoustics.com
Ecophon Ltd (Saint-Gobain)	01256 850977	www.ecophon.co.uk
Eomac UK Ltd	0191 516 6550	www.eomac.com
Fabritrak	020 8789 4063	www.fabitrak.co.uk
LSA Projects Ltd <ul style="list-style-type: none">UK Distributor for <i>Gustafs</i>	01376 501199	www.lsaprojects.co.uk www.gustafs.com
Hodgson & Hodgson Group Ltd	01664 821810	www.acoustic.co.uk/H&H/Home.htm
IAC	01962 873000	www.industrialacoustics.com
Knauf AMF Ceilings Ltd	020 8892 3216	www.amfceilings.co.uk
Oscar Acoustics <ul style="list-style-type: none">Spray on acoustic treatment	01474 873122	www.oscar-acoustics.co.uk
OWA	01753 552489	www.suspended-ceiling-systems.co.uk
Pacy & Wheatley	01302 760843	www.pacy-wheatley.co.uk/
Rockfon	020 8222 7457	www.rockfon.co.uk
RPG (Acoustic GRG Products Ltd.)	01303 230944	www.rpg-europe.co.uk
SAS International <ul style="list-style-type: none">Metal ceiling systems	01189 290900	www.sasint.co.uk
Siderise	020 8391 3650	www.siderise.co.uk
Soundsorba	01494 536888	www.soundsorba.com
Sto	0141 892 8000	www.sto.co.uk
Stretch Ceilings (UK) Ltd <ul style="list-style-type: none">Formerly <i>Barrisol</i>	01276 681000	www.stretchceilings.co.uk
Thermafleece <ul style="list-style-type: none">Sustainable alternative to mineral wool	01768 486285	http://www.thermafleece.com/
Triple E Ltd <ul style="list-style-type: none">Operable drapes and blinds	01959 570333	www.3-eee.com
Whitecroft lighting <ul style="list-style-type: none">Sound absorbent light fittings	0870 5087087	www.whitecroftlighting.com

■ End of Section

WALLSORBA® Acoustic Panel System



ACOUSTIC SOLUTION FOR NOISE & REVERBERATION

WALLSORBA® are high specification acoustic panel systems. These are the most popular aesthetic sound absorbing panels. They are durable, fire rated, visually pleasing and offer excellent acoustic performance. They are the decorative solution to your sound control needs. The panels are used extensively to transform areas such as multi-purpose halls, open-plan offices, conference suites, studios and interview rooms into softer, quieter and workable environments.

Panels are finished in high quality acoustic fabrics available in a wide range of colours.

WALLSORBA® ACOUSTIC PANEL SYSTEMS

APPLICATION

Wallsorba acoustic panels are used to reduce reverberant noise levels in buildings such as studios, lecture theatres, music rooms, offices, boardrooms, sports and community halls, classrooms, cinemas, interview rooms and other applications.

Wallsorba panels transform a stark, echoing area into a warm, quieter, congenial work place.

Wallsorba panels are pre-decorated and therefore they decorate and solve the acoustics in one operation.

If required, small display posters can be pinned to panels. As manufacturers of specialist innovative products with leading edge designs, we manufacture each order to your particular Wallsorba order requirements ranging from your chosen colour to the particular dimensional size of the panel to specifically suit your individual project.

FINISHES

A wide range of standard fabric colours are available, as illustrated later in this brochure. A wide range of other fabrics and colours are also available on request. Customer's individual fabrics can be used, if suitable.

The UPVC trims are available in white. However, the visible trims may be suitably spray painted on site to achieve the required colour. UPVC is the same material as used in double glazed window frames. Please state the height and width dimensions of each panel when ordering.

WEIGHT

The 25mm thick Wallsorba weigh approximately 3 kg/m². The 40mm thick Wallsorba weigh approximately 4 kg/m². UPVC trims weigh approx. 1 kg/length.

Panels are manufactured to our standard dimensional size tolerance of +/- 3.0mm.

Walls and ceiling surfaces must be flat and level.

Type C – Wallsorba – Available in the following shapes: Square, Rectangle, Circle, Ellipse, Triangle, Diamond, Hexagon, Pentagon, Teardrop, Cloud and Two-part circle.

There are 3 standard versions of wallsorba panels:

- Type A: WALLSORBA – Tee joint panel system.
- Type B: WALLSORBA – Butt joint panel system.
- Type C: WALLSORBA – Shadow joint panel system
Type C: WALLSORBA – Shapes.
- Type D: WALLSORBA – Ecopaint panel system.

Panels are manufactured to our standard dimensional size tolerance of +/- 3.0mm.

Walls and ceiling surfaces must be flat and level.

CUTTING

Wallsorba panels can be cut with a sharp kitchen or Stanley knife. UPVC trims as well as panel edge reinforcements can be cut easily with a fine tooth fret saw or strong snips.

FIRE RESISTANCE

The recycled glasswool acoustic board provides very good fire resistant properties.

This is fire rated as Class 0 to BS476: Part 6.

Standard fabric facings comply with Class 1 to BS476: Part 7.

Class 0 fire rated fabric finishes are also available on request.

UPVC trims are fire rated as BS476 Part 7. Like normal UPVC, the trims have a maximum softening limit of 60°C.

THERMAL INSULATION

The acoustic recycled glasswool board provides an excellent heat and cold insulator. This adds to the energy saving measure in a building as well as reducing the noise levels. The panels have a thermal conductivity of $k = 0.0377 \text{ w/m}^{\circ}\text{C}$.

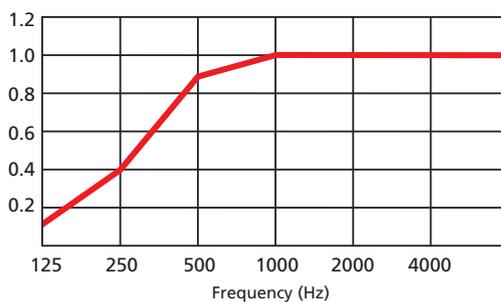
CLEANABILITY AND MAINTENANCE

The panels are designed for long term use in building environments with minimal maintenance. However, the panels can be vacuum cleaned periodically. Any slight dirt marks may be cleaned with a damp cloth or a proprietary cleaner.

CLASS C Acoustic Absorber - 25mm thickness

ACOUSTIC PERFORMANCE BS EN ISO 354:2003

Noise Reduction Coefficient 0.85 (i.e. 85%)

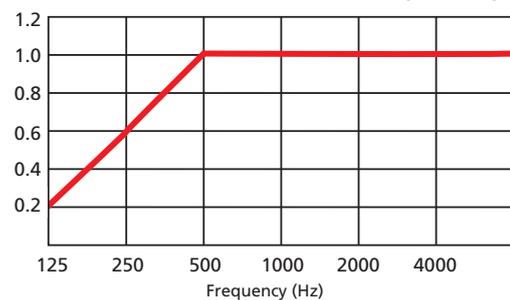


Direct fixed backing
Even higher absorption can be achieved when installed with an air gap

CLASS A Acoustic Absorber - 40mm thickness

ACOUSTIC PERFORMANCE BS EN ISO 354:2003

Noise Reduction Coefficient 0.90 (i.e. 90%)



Direct fixed backing
Even higher absorption can be achieved when installed with an air gap

KEEPING IT GREEN

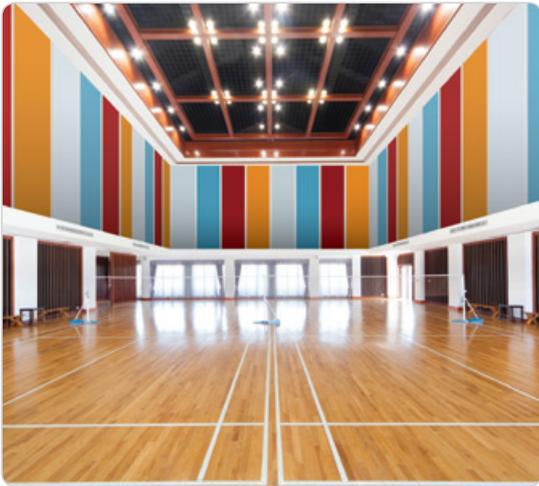
Soundsorba Glass fibre sound absorbing boards consist of recovered household glass and recycled glass fibre.

The fabric range used is made from 100% recycled materials saving virgin raw materials, reducing waste to landfill and minimising our damage to the environment. Made using sustainable manufacturing techniques, including green electricity, comprehensive energy and effluent management, borehole water and on-going waste saving initiatives.

Second Nature fabrics leave a lighter environmental footprint.

Our ethos is focused on continuing to achieve the highest environmental standards for our operations, products and innovations, engaging with, and acting responsibly towards, our local community and wider interest groups.

TYPE A: WALLSORBA® - TEE JOINT PANEL SYSTEM



This is the most economical panel utilising white UPVC fixing sections. The panels have cut edges on all four sides.

The UPVC sections serve two functions. One is to decoratively mask the edges and the other is as structural fixing sections. This system is the most flexible as panels can be cut on site to suit wall dimensions.

NOMINAL DIMENSIONS

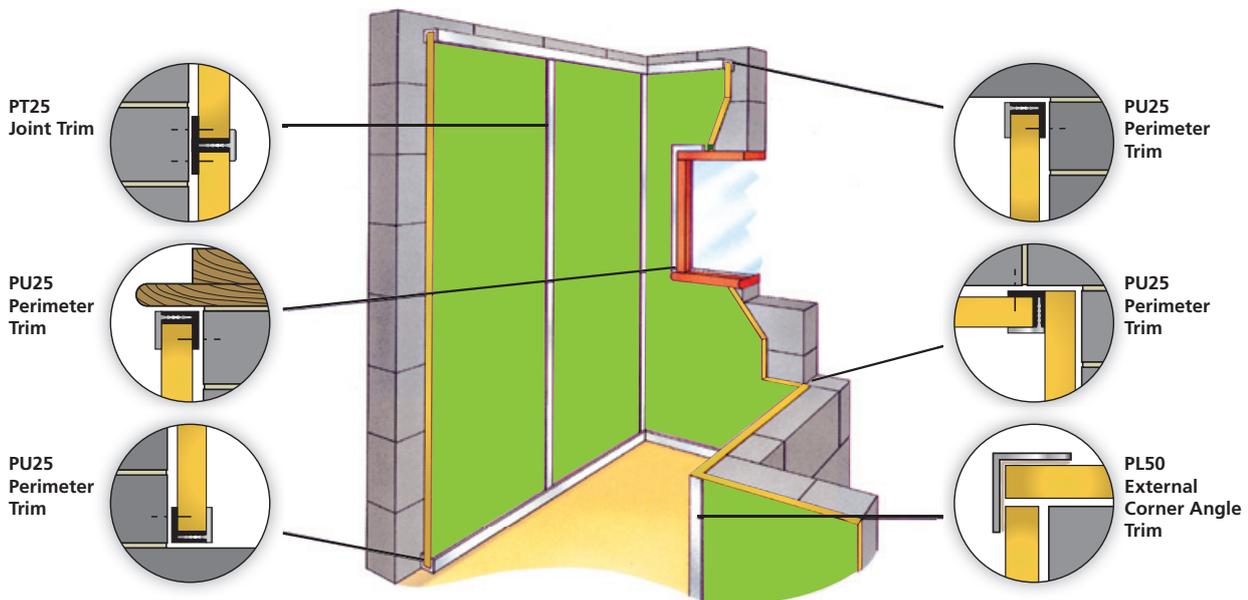
Panel size: 2700mm x 1200mm.

Panel thickness: 25mm (40mm thickness available on request).

UPVC fixing trims: 2700mm lengths.

INSTALLATION

Use spirit level to align all horizontal and vertical surfaces. Drill oversized holes in UPVC female trims larger than screw shank, but smaller than screwhead. Use V line as guide. Screw fix at maximum of 400mm centres. The backing wall, to which the Wallsorba acoustic panels are to be fixed, must have a continuous solid backing wall surface which must be flat and level.



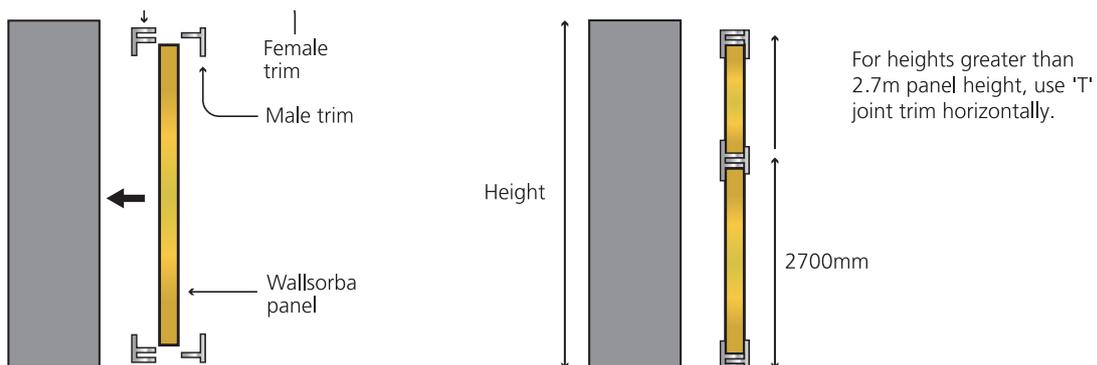
FIXING GUIDE

A. Screw fix UPVC female perimeter trim to top, bottom and end of walls.

B. Screw fix UPVC female 'T' joint trim vertically between top and bottom UPVC female perimeter trims, allowing for Wallsorba panel width and height.

C. Cut and insert individual Wallsorba panels to fit between female perimeter and female 'T' joint trims. Push fit top and bottom male perimeter trims into female trims. Then neatly cut vertical male perimeter and vertical male 'T' joint trims to fit between the top and bottom perimeter trims and push fit together. Ensure that all trims are fully pushed in and located. On external corners, glue the PL50 angle trim as illustrated above.

EASY FIX INSTALLATION - by using UPVC clip-in trims



TYPE B: WALLSORBA® - BUTT JOINT PANEL SYSTEM



This eliminates the requirement of a tee joint section as this panel has reinforced long edges and the fabric facing is wrapped around the two long edges of the panel. This results in a neat, crisp butt joint between the panels.

NOMINAL DIMENSIONS

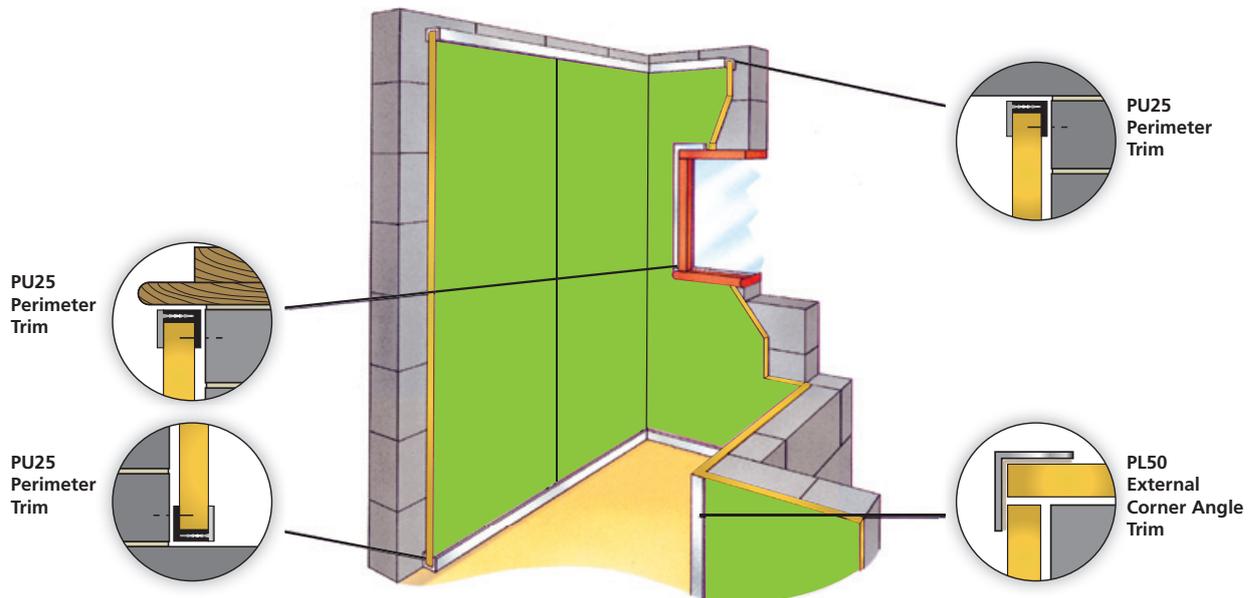
Panel size: 2700mm x 1200mm.

Panel thickness: 25mm
(40mm thickness available on request).

UPVC fixing trims: 2700mm lengths.

INSTALLATION

Use spirit level to align all horizontal and vertical surfaces. Drill oversized holes in UPVC female trims larger than screw shank, but smaller than screwhead. Use V line as guide. Screw fix at maximum of 400mm centres. The backing wall, to which the Wallsorba acoustic panels are to be fixed, must have a continuous solid backing wall surface which must be flat and level.



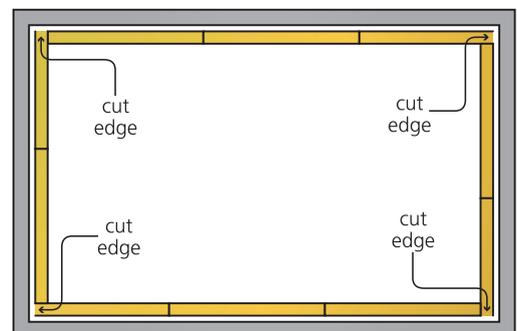
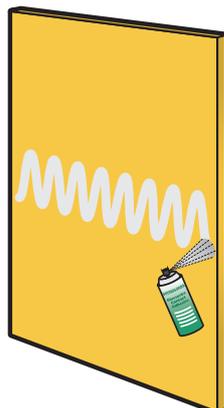
FIXING GUIDE

A. Screw fix UPVC female perimeter trim to top, bottom and end of walls.

B. Cut panels to size. Position individual Butt Joint WALLSORBA panels to fit between the female perimeter trims. Ensure that the visible panel butt joints are tight and straight.

C. Remove panels away from wall and spray a 12" horizontal band of Gluesorba™ spray can adhesive. This should be done about half way down the height of the back of the panel. Then spray a similar band on the corresponding position on the wall so it coincides with the glue position on the back of the panel. Allow adhesive to dry for approximately 2 to 5 minutes at 23°C. Carefully reposition the panels in the original positions. The panels must be carefully repositioned, as once contact is made with the adhesive they cannot be readjusted.

D. Push fit top, bottom and end male perimeter trims into female trims. Ensure that all trims and panels are fully pushed in and located. On external corners, glue the PL50 angle trim as illustrated above.



If panelling runs generally end in a corner of a room, the nearest method is shown above. Because no panel run has more than one cut edge at each end therefore all these are hidden in corners by the uncut panel. This eliminates the need for any internal corner trims hence resulting in a neater finish.

TYPE C: WALLSORBA® - SHADOW JOINT PANEL SYSTEM



This panel has no visible fixing sections on any of the four sides of the panel. The panel has internal reinforced edges on all sides with the fabric bonded to the face and wrapped on all four sides. This results in a beautiful individual panel which can be used in single units or joined together to other panels or with shadow gaps as a design feature.

NOMINAL DIMENSIONS

Standard sizes: 1200 x 900mm, 1200 x 1200mm, 1200 x 1500mm, 1200 x 1800mm, 1200 x 2100mm, 1200 x 2400mm, 1200 x 2700mm.

Panel thickness: 25mm

(40mm thickness available on request).

Custom size panels made to customers requirements are available.

Please state the height and width dimensions of each panel when ordering. e.g. 1050mm wide x 1710mm high. The fabric has a directional weave, hence we must be notified of the height and the width of each panel.

INSTALLATION TO WALLS

The acoustic panels are installed using impaling clips and Gluesorba contact spray adhesive. This method allows the panels to be fixed direct to concrete, brickwork, wood, plaster, or metal. A site installation guide is sent with each delivery.

The backing wall, to which the Wallsorba acoustic panels are to be fixed, must have a continuous solid backing wall surface which must be flat and level.

The Soundsorba Impaling clips have 4mm diameter holes to take pan head screws. Using appropriate screws and plugs, etc. depending on your wall substrate, fix the correct number of impaling clips needed to the size of the panel. The larger the panel, the greater the number of impaling clips. A guide is given below. Keep impaling clips about 300mm in from the perimeter edges of the panel.

Lightly mark the panel location on the desired wall area. Fix the appropriate number of impaling clips using the appropriate screw fixings. Caution: do not place hands, fingers or other parts of your body in front of impaling clips.

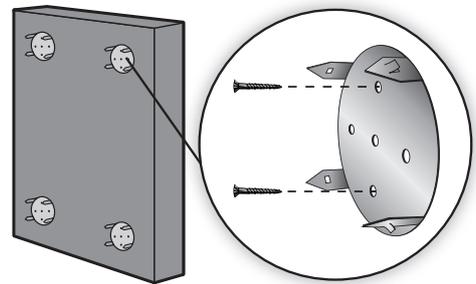
The wall must be clean, dry and free from loose paint or plaster, dust, oils, grease, etc. Wallpaper should be removed, gloss paint roughened and emulsion paint brushed with stiff brush to ensure it is firm. On absorbent surfaces an initial priming coat of Gluesorba spray adhesive may be necessary.

Screw fix the appropriate number of impaling clips to the wall. Spray the Gluesorba contact adhesive on the back of the panel and also on the designated wall area (including the fixed impaling clips). Apply the adhesive vertically on the panel and horizontally on the wall area. Make sure that 100% of the areas are covered with adhesive. Allow adhesive to dry for approximately 2 to 5 minutes at 23°C.

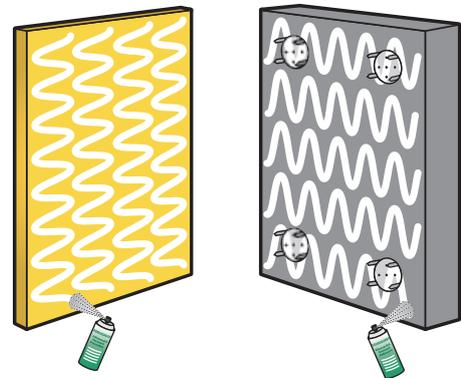
Then carefully push the panel onto the marked wall enabling the impaling clips to bite into the rear of the panel and press firmly all over the panel to ensure that glue contact has been made over all of the panel.

There are different depths of impaling clips for 25mm thick panels and for 40mm panels. You will be supplied with the appropriate depth impaling clips according to the thickness of your panel order.

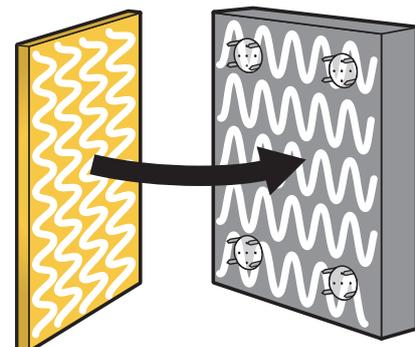
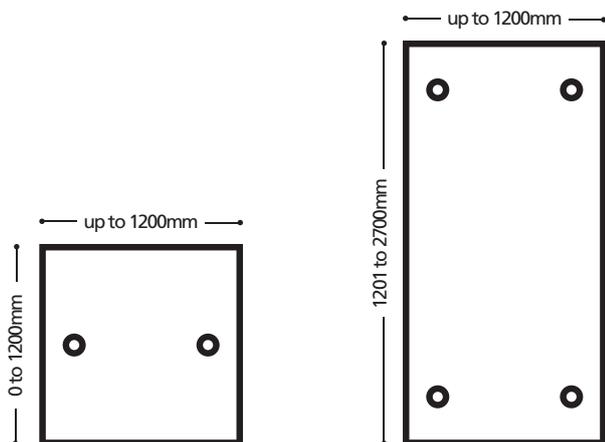
Ceilings: Panels greater than 1200 x 600mm should not be fixed to ceilings unless other mechanical methods are used such as "Z" clips (see page 6).



Fix 'impaling clips' to the wall.



Spray wall and surface of Wallsorba panel with Gluesorba contact spray adhesive, ensuring that 100% of both surfaces are covered.

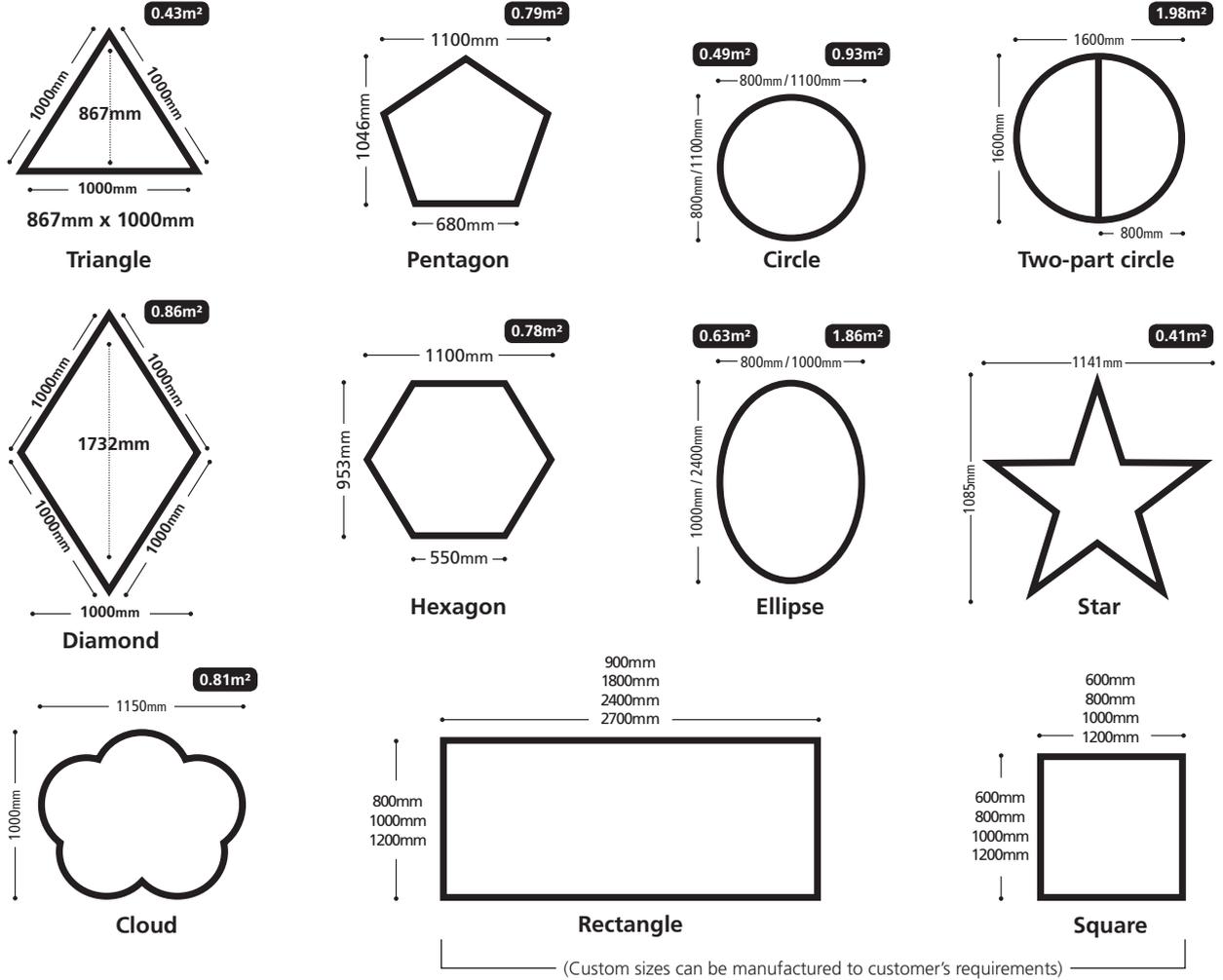


Push Wallsorba panel on to wall and 'impaling clips' and press firmly.

Every endeavour has been made to ensure that the information given herein is true and reliable but is given only for guidance. The company cannot accept any responsibility for loss or damage that may result from the use of the information, due to the possibility of variations of processing or working conditions and of workmanship outside our control. Users are advised to confirm the suitability by their own tests. All panels are manufactured to our standard dimensional size tolerances of +/- 3.0mm.

TYPE C: WALLSORBA® SHAPES

All Type C Wallsorba panels are designed to be manufactured in the following shapes. Panels are installed by using Gluesorba contact adhesive and metal clips. Panels are manufactured to our standard dimensional size tolerance of +/- 3.0mm. Walls and ceiling surfaces must be flat and level. Some fabric facings have a directional grain therefore it is important to specify the height and the width of each panel when ordering. The backing wall, to which the Wallsorba acoustic panels are to be fixed, must have a continuous solid backing wall surface which must be flat and level.



Wallsorba® Type C - Shadow Joint Panel System used in a lecture hall.

TYPE D: WALLSORBA® - ECOPAINT SURFACE FINISH



This version has an Arctic white speckled painted finish on all 6 sides, giving a crisp visually attractive appearance. The panels can be fitted as individual stand-alone panels as a design feature or can be butted together to form continuous wall linings. The perimeter edges of the panels are square edged.

These panels are NOT designed for impact resistance. If impact resistance is required then use the fabric faced versions. The majority of the applications of these Wallsorba - Ecopaint panels will be above door head height, out of touching reach. The panels can be fitted vertically or horizontally.

NOMINAL DIMENSIONS

Standard sizes: 1200 x 1200 x 40mm thick
and also: 2400 x 1200 x 40mm thick

Circle Panels: 800 diameter x 40mm thick
1200 diameter x 40mm thick

ACOUSTIC RATING: These are Class A sound absorbers

Frequency (Hz)	125	250	500	1000	2000	4000	NRC
Absorption Coefficient (direct to backing)	0.25	0.75	0.95	1.00	1.00	1.00	1.00

FIRE: The panels are Class 0 fire rated.

WEIGHT: Nominal 4 kg/m²

The standard Wallsorba - Ecopaint surface finish comes in a visually pleasing Arctic white speckled painted finish. However, they can be emulsion spray painted on site to any colour with little significant effect on acoustical performance. The panels can be painted for aesthetic reasons or even in the future to cover any dirty marks or maybe discolouration from cigarette smoke, etc. It is important that the paint is water based matt emulsion painted and is applied in a very light mist spray coat so that the acoustics are not affected.

INSTALLATION TO WALLS

Clean white gloves must be used when handling these panels to avoid marking the panels.

(A) Where the panels are going to be cut to width and height

Use the installation method shown on Page 3 of this Wallsorba brochure, which is same as Tee Joint panel system using PT40 Joint Trim and PU40 Perimeter Channel to suit the 40mm thickness Type D Wallsorba - Ecopaint acoustic wall panel.

(B) Where the panels are going to be cut to height

Use the installation method shown on Page 4 of this Wallsorba brochure, which is same as Butt Joint panel system using PU40 Perimeter Channel, to suit the 40mm thickness Type D Wallsorba - Ecopaint acoustic wall panel.

(C) Where the panels are not going to be cut

Use the installation method shown on Page 5 of this Wallsorba brochure, which is same as the Type C, using the metal impaling clips and the Gluesorba contact adhesive. This installation method is ideal where the panels are not going to cut. This allows the panels to be installed as individual panels with space between the panels to suit the visual requirements or the panels be can be butt jointed.

All panels are manufactured to our standard dimensional tolerances of +/- 3.0 mm.



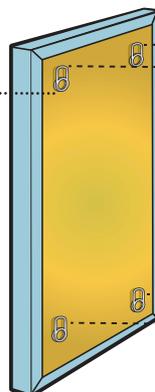
Every endeavour has been made to ensure that the information given herein is true and reliable but is only given for guidance. The company cannot accept any responsibility for loss or damage that may result from the use of the information, due to the possibility of variations of processing or working conditions and of workmanship outside our control. Users are advised to confirm the suitability by their own tests. All panels are manufactured to our standard dimensional tolerances of +/- 3.0 mm.

REMOVABLE PANEL OPTIONS

TYPE C OR TYPE D - ALTERNATIVE FIXING METHODS

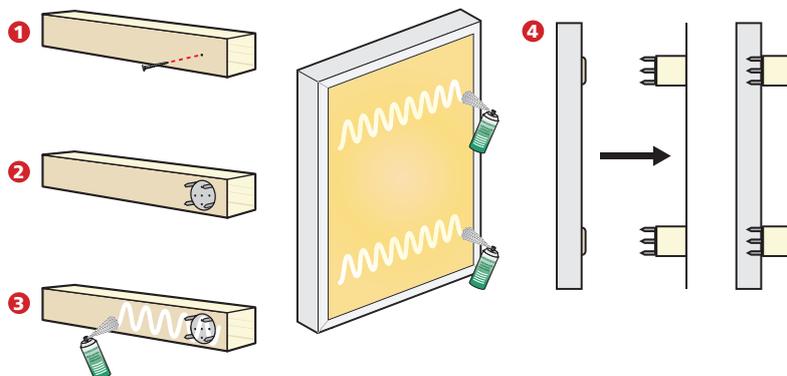
For all Type C or Type D Wallsorba panels, we recommend the application of Gluesorba and metal impaling clips as the primary means of installation to walls to maximise acoustic insulation properties. However, in circumstances where Gluesorba is not a viable option, below are 4 alternative means of install to consider when choosing Wallsorba Type C or Type D panels. Please carry out your own tests by installing a trial panel before proceeding with the full installation to ensure that the installation is satisfactory for your application.

1. SPIRAL HOOK FIXING



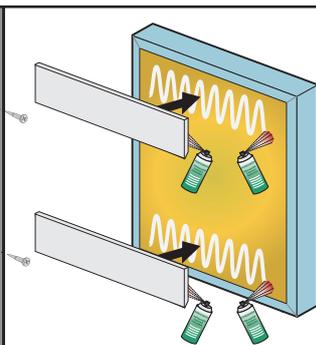
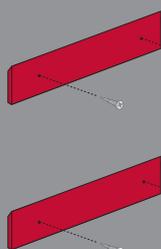
Total number of hooks used will differ depending on panel sizes. Please request a full installation guide

2. TIMBER BATTENS TO SPACE PANELS AWAY FROM WALL

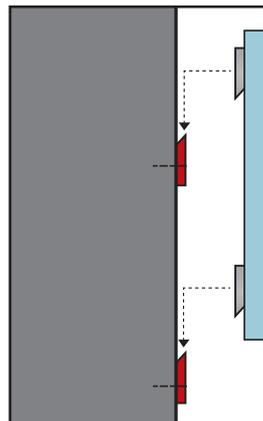


1. Screw timber battens to wall at appropriate centres to suit acoustic panel being installed. Thickness of timber battens to suit the required air gap. Width of timber batten should be minimum of 65mm.
2. Screw fix the circular metal impaling clips to the timber battens. For acoustic panels up to 1200 x 1200mm sizes, 4 circular metal impaling clips should be used per panel. For acoustic panels of greater than this size, then 6 circular metal impaling clips should be used per panel.
3. Spray Gluesorba contact adhesive over all the batten face area. Also spray adhesive to the corresponding area on the rear of the acoustic panels. Wait approx. 3 minutes to allow the adhesive to dry at a room temperature.
4. Press the acoustic panels onto the circular metal impaling clips. Ensure firm contact between the rear of the acoustic panel and the timber battens.

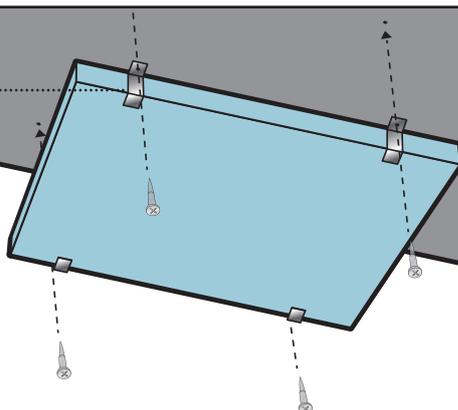
3. UPVC SPLIT BATTEN FIXING



Please request a full installation guide. Split batten to be used on panels not larger than 1200x1500x25mm. The split battens should not be used on 40mm thick panels.



4. Z-CLIP "CEILING" FIXING



Total number of Z Clips used will differ depending on panel sizes. Please request a full installation guide.



Wallsorba® Type B - Butt Joint Panel System using colours to complement the furniture colour in this board room.



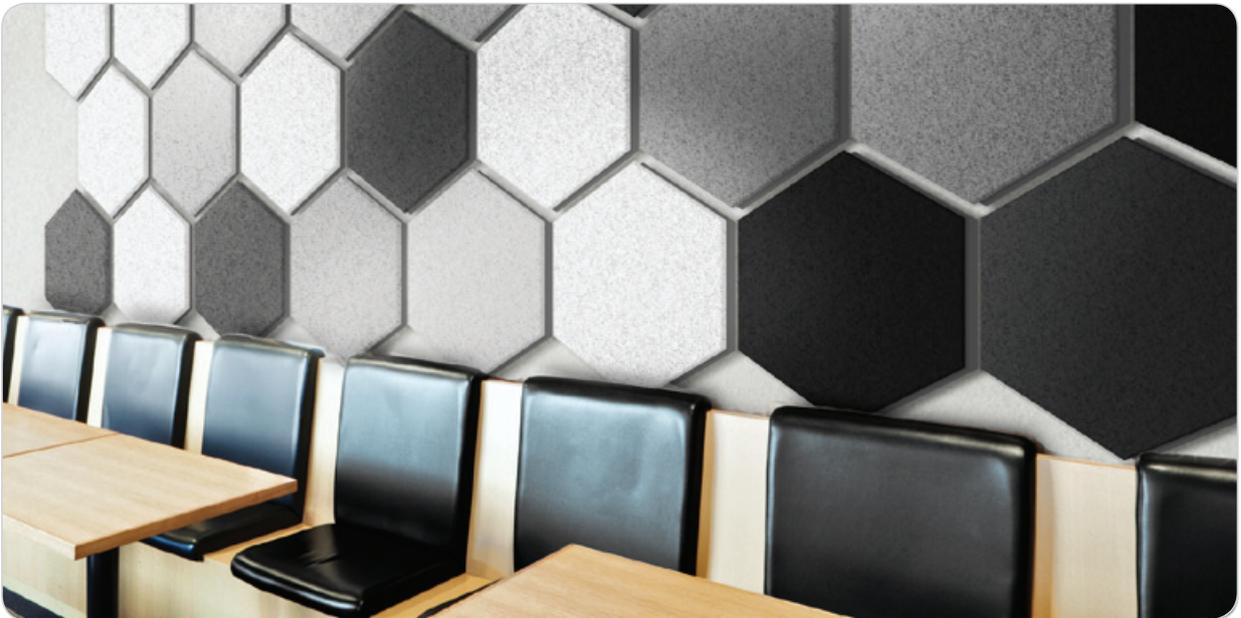
Wallsorba® Shapes - Circles and ellipses applied creatively to an atrium area.



Wallsorba® Type A - Tee-Joint Panel System using a range of different shades in an office environment.



Wallsorba® Type A - Tee-Joint Panel System applied to the upper wall in a sports hall.



Wallsorba® Shapes - Hexagon panels used as a design feature in a cafeteria.



Wallsorba® Type C - Shadow Joint Panel System used in a class room.

FABRIC COLOUR RANGE - LUCIA

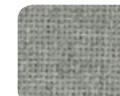
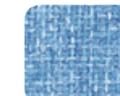


 Adobo YB165 LR = 85.8	 Oyster YB107 LR = 64.8	 Turtle YB098 LR = 39.14	 Apple YB096 LR = 37.16	 Solano YB088 LR = 36.13	 Madura YB156 LR = 43.08	 Sandstorm YB302 LR = 22.78	 Reef YB085 LR = 45.6
 Aruba YB093 LR = 37.39	 Belize YB105 LR = 10.49	 Campeche YB301 LR = 27.43	 Bridgetown YB102 LR = 11.34	 Diablo YB101 LR = 6.99	 Jamaica YB027 LR = 7.2	 Calypso YB106 LR = 6.4	 Windjammer YB047 LR = 9.02
 Taboo YB045 LR = 4.15	 Tobago YB030 LR = 3.11	 Lobster YB087 LR = 11.55	 Tortuga YB168 LR = 30.46	 Montserrat YB011 LR = 7.94	 Arecibo YB099 LR = 45.31	 Bermuda YB084 LR = 32.9	 Mauve YB069 LR = 14.64
 Tarot YB090 LR = 3.01	 Ocean YB100 LR = 3.56	 Scuba YB089 LR = 6.37	 Bluebell YB097 LR = 16.91	 Martinique YB004 LR = 12.79	 Steel YB095 LR = 23.03	 Bluefield YB021 LR = 8.27	 Marianna YB157 LR = 33.48
 Tequilla YB038 LR = 14.56	 Slip YB094 LR = 27.94	 Blizzard YB108 LR = 12.23	 Havana YB009 LR = 2.26	 Sombbrero YB046 LR = 4.36	 Costa YB026 LR = 3.38	 Buru YB170 LR = 24.37	 Rum YB086 LR = 38.32

LR = Light Reflectance

FABRIC COLOUR RANGE - CARA



 Vit EJ184 LR =	 Glass EJ004 LR = 46.32	 Lomond EJ192 LR =	 Clan EJ169 LR = 62.3	 Beltane EJ193 LR =	 Shetland EJ191 LR =	 Hillswick EJ190 LR =	 Denny EJ196 LR =
 Maree EJ195 LR =	 Chaucer EJ172 LR = 25.94	 Ronay EJ189 LR =	 Easdale EJ188 LR =	 Austen EJ173 LR = 39.8	 Spray EJ033 LR = 16.46	 Lora EJ187 LR =	 Dolphin EJ105 LR = 35.65
 Lerwick EJ194 LR =	 Portland EJ016 LR = 14.26	 Fair Isle EJ186 LR =	 Inverness EJ175 LR = 31.48	 Lead EJ104 LR = 18.39	 Staffa EJ185 LR =	 Galilee EJ125 LR = 18.96	 Adriatic EJ154 LR = 8.79
 Lossie EJ197 LR =	 Merrick EJ048 LR = 12.23	 Carron EJ015 LR = 8.67	 Cluanie EJ180 LR = 4.13	 Tummel EJ038 LR = 6.65	 Pitlochry EJ076 LR = 8.59	 Walten EJ011 LR = 3.46	 Black EJ138 LR = 1.65

LR = Light Reflectance

Due to printing reproduction restraints, differences may appear between colours printed above and the actual product. Sample fabric colour charts are available on request. Colour shade differences may occur between different production batches.

Please state the height and width dimensions of each panel when ordering. e.g. 1050mm wide x 1710mm high. The fabric has a directional weave, hence we must be notified of height and width of each panel.

Please ask for up-to-date fabric swatch as colour options are constantly being updated.

GUIDE SPECIFICATION

A. GENERAL

1. All Wallsorba panels should be installed in accordance with the manufacturer's recommendations.
2. All necessary hardware and accessories for a complete job installation are to be furnished by the contractor.
3. Installation of panels should not begin until all wet work, such as plastering, concrete etc. is completely dry. The panels are designed for storage and installation under standard occupancy conditions from 10°C to 20°C and not more than 75% R.H in an enclosed building.
4. The contractor shall be responsible for the examination and acceptance of all surfaces and conditions prior to the acoustic panel installation.
5. Install a trial panel and ensure that this is satisfactory before proceeding with the full installation.

B. PRODUCT

1. Install

Type A: Wallsorba - Tee Joint Panel System with UPVC perimeter and Tee Joint fixing trims.

Type B: Wallsorba - Butt Joint Panel System with UPVC perimeter fixing trims and Gluesorba™ contact spray adhesive.

Type C: Wallsorba - Shadow Edge Panel System with Gluesorba™ contact spray adhesive and fixing clips or specified alternative method.

Panels size.....mm wide x.....mm high.

Type C: Wallsorba - Shapes Panel System with Gluesorba™ contact spray adhesive and fixing clips or specified alternative method.

Type D: Wallsorba - Ecopaint Panel System with Gluesorba™ contact spray adhesive and fixing clips or specified alternative method.

2. Finish

Wallsorba® panels to be in (..... colour)
Soundsorba standard colour.

C. Supplier

1. Wallsorba® panel systems as supplied by Soundsorba Ltd, 27-29 Desborough St, High Wycombe, Bucks HP11 2LZ, UK
Tel: +44 (0)1494 536888 Fax: +44 (0)1494 536818
Email: info@soundsorba.com www.soundsorba.com

A few of the well known organisations who use Soundsorba:

EDUCATIONAL

Warwickshire College
Teignmouth Community Collage
Sewell Park College
Queen Mary University
Lancaster University
Hope Academy
Northampton College
Northfleet School
Rickstones Academy
John Clare Orimary School
University of Liverpool
Oxford University
Gosforth Junior High School
Teddington School
Newcastle St Cuthberts School
Reigate College
St Kentigerns Academy
Wallace Hall Academy

FINANCIAL

HSBC
Barclays Bank
Lloyds TSB
Natwest
Santander
Nationwide
Halifax

ENTERTAINMENT

The Big Soup Theatre
Wendy Whatling school of dance
Ascot Racecourse
Arab News Network
Deniros Nightclub
Sky News
Cornhill Squash Club
ITV
Facebook

HEALTHCARE

GE Healthcare
Upton Hospital
Glaxo Smithkline
Lynebank Hospital
Broadmoor Hospital
David Ormerod Hearing Centre
Grove Road Clinic
Sheffield Childeren's Hospital
Truecare Group Ltd
Brentwood Community Hospital
Kings Park Hospital
Southampton General Hospital

COMMUNITY HALLS / CHURCH HALLS

Stockenchurch Scouts HQ
St Peters Church
Axminster United Reformed Church
Hoveringham Village Hall
Deanshanger Community Centre
Barnhill St Margarets Parish Church
Punnetts Town Village Hall
Radstock Youth Centre
Champions Church
Gascoigne Community Centre
Cumber Church

POLICE AUTHORITIES

Cumbria Police Authority
Sussex Police
Thames Valley Police Abingdon
Bury Police HQ
Brighton Police Station
Blackpool Central Police
High Wycombe District Council
Leeds City Council

Police Authorities in the UK use Wallsorba as primary acoustic treatment for Recorded Evidence Rooms

Prices and Conditions of Sale

Our standard terms and conditions (copy available on request) apply to all orders. Since Soundsorba Limited exercise no control over the use of its products, no legal responsibility is accepted for any application of their products. We reserve the right to change specifications without notice as our policy is one of continuous improvement. Copyright Soundsorba Limited 2015.