



# Acoustic Room Treatment Guide


Rev 2

# 2 Contents



## Contents

Who Are Universal Acoustics?	3
Why You Need Acoustic Treatment	4-6
How to Treat Your Room	8
Room Kits	9-13
Frequently Asked Questions	12
Product Line Up	14-17
Home Cinema Treatment	18-19

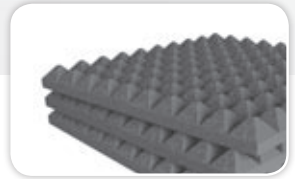
View all product information online at [www.universal-acoustics.com](http://www.universal-acoustics.com) 

# Who Are Universal Acoustics?

The team behind Universal Acoustics has been a driving force in the pro-audio industry for many years. And it's this expertise which goes into the wide range of products we offer to acoustically treat your control room / studio / home cinema room; including speaker isolating Vibro-Pads, Absorption Tiles, Diffuser Tiles, Bass Traps and pre-configured Room Kits.

Cut in striking contemporary designs from high density flame retardant polyester foam, our studio products are perfect for use in recording, post production and broadcast studios, music rehearsal rooms, audio and language labs, boardrooms, offices, staff rooms, gymnasiums - in fact any open space which requires efficient sound absorption to improve the audio integrity, intelligibility and sonic performance of the room. Plus, we now offer our Eclipse range of Home Entertainment products which are available in a variety of finishes and fabrics to satisfy any Interior Designer.

This handy guide 'walks' you through how acoustic treatment works, why you need it and the process of treating a room.



Absorption Tiles



Room Kits



Architectural



Eclipse Home Cinema



# 4 Why You Need Acoustic Treatment

## Acoustic Primer

We live in a world where high quality sound systems are now relatively inexpensive but few people realise how much the performance of even the very best system can be compromised by poor room acoustics. You might think you're just listening to your loudspeakers but what actually arrives at your ears is a mix of the direct sound from the speakers plus countless sonic reflections from all the hard surfaces in the room, including the walls, ceiling floor and furniture. Some sound reflection is required to stop a room from sounding unnaturally dead, but unless it is carefully controlled, you will experience problems such as bass notes sounding muddy, different notes in the bass line sounding louder or quieter than they should, a lack of focus in the mids and highs and vague stereo imaging where it becomes difficult to tell where a sound is supposed to be coming from.

Some people take what seems like an intuitive approach and stick carpet to the walls, a problem often encountered in 'enthusiasts' recording studios. Carpet seems to dry up the sound so why not? The reality is that the effectiveness of a 'porous' acoustic absorber is linked to its physical thickness where greater thicknesses are needed to treat low frequency (bass) reflections than high frequencies. Carpet will dry up the very high frequencies but does little in the mid range and nothing at all at low frequencies, so what you end up with is a room dominated by mid and low frequencies resulting in a boxy, oppressive sound. The ideal situation is where the acoustic treatment works well at all frequencies so that the room reflections can be controlled without throwing the overall sound out of balance.

It is also important to understand the difference between acoustic treatment and soundproofing as they are two quite separate disciplines. Filling wall cavities with mineral wool or adding layers of plasterboard to a partition wall may improve sound isolation but will have little or no effect on the room acoustics. Conversely, applying acoustic treatment to a room with a view to improving the listening environment will do nothing to prevent sound leaking in or out of that room.

## Sound Absorbers

There are several approaches to designing sound absorbers, some requiring precise calculations in order to tailor them to specific room problems and others designed to be applied in a more intuitive way. At mid and high frequencies, sheets of porous absorber are very effective, suitable materials include mineral wool, glass fibre and acoustic foam. All these work by allowing the air to pass through the material, losing vibrational energy as it does so. Essentially the sound energy is converted to heat via frictional losses in the material, though the amount of heat generated is vanishingly small. As a significant proportion of the sound energy is absorbed, little reflects back into the room. A porous absorber of 50mm thickness will be effective against high and upper mid frequencies while a 100mm thickness will cover the high end plus most of the mid range. Spacing the foam away from the wall by between 25 and 100mm, leaving an air gap behind, also improves the ability of the foam to absorb at lower frequencies. As the frequency gets lower, the amount of energy absorbed by these porous panels becomes progressively less, so a different approach has to be taken to remedy low frequency problems.

# Universal acoustics

Experience has shown that in rectangular rooms less than around four metres wide, the bass end is least problematic when the speakers are directed down the length of the room rather than across it. Speakers should also not be sited too close to corners, otherwise the reflected bass energy combines additively with the direct bass energy causing peaks in the bass response. While this may sound like 'free bass', the differing wavelengths of different bass notes means that the amount of added bass due to wall reflections varies from note to note resulting in a very uneven bass response.

Bass frequencies are reflected most effectively by solid brick or concrete walls, so these are the most difficult rooms to treat effectively. Partition walls made from plasterboard and wood studding allow some bass to pass through rather than reflecting it all back into the room, but they also tend to vibrate in sympathy with low frequencies, which sucks some energy out of the sound and again reduces the amount reflected back into the room. The same is true of doors and windows; these lose bass energy by allowing it to pass through and also by frictional losses when they are forced into vibration. Losing bass energy in this way in no way detracts from the quality of bass perceived in the room though - it simply makes the low end sound more even and less boomy.

To check if you have any serious bass end problems, play a record with a busy and well defined bass line, then listen to see if any of the notes are excessively loud or quiet compared with the others. If you can hear a variation, first try moving the speakers (or sub if your system has one) to a slightly different location and see if that improves matters or makes them worse. Even a position change of

as little as 100mm can make a significant difference and it costs nothing to try.

If you use a system with a sub, one effective way of finding the best position for it is to temporarily place the sub where you normally sit, then listen to a record from a position low down and close to the front wall. As you move along the wall, you should notice that the bass end becomes more or less even, so find the spot where the sound is most even in level, then place your sub there. This will normally be off to one side of the centre of the



front wall. Once you've done the best you can with the speaker positioning, it's time to think about adding some bass trapping.

# 6 Why You Need Acoustic Treatment

Low frequencies pose a particular problem as the wavelengths are very long - around 7 metres at 50Hz. A porous absorber needs to be around a quarter of a wavelength deep to be really effective at any given frequency so a conventional foam panel would need to be over 1.5 metres thick, which is not entirely practical. While the much shorter wavelengths of high and mid frequencies allow them to reflect in a naturally chaotic

that generate room modes - there are also more complex modes that involve the sound re-reflecting from two or more walls - the so-called tangential and oblique modes, and these also contribute to the end result.

The best sounding rooms are ones where the room modes are fairly evenly spread out so that the average bass response is reasonably consistent. Larger rooms are better than small rooms in this respect as they can support more room modes and rooms where no two sets of wall spacings are identical or exact multiples of each other fare best. The worst case is a small, cube-shaped room as there are few room modes and they all occur at the same frequency, whether due to wall-to-wall reflections or floor-to-ceiling reflections. If you sit at the exact centre of such a room with your head mid-way between floor and ceiling, you'll notice the amount of audible bass drops significantly as there's a lot of cancellation going on at that position. Move closer to the walls and you'll hear a lot of bass but it is unlikely to sound very even.



way, very low frequencies behave more predictably, just like water sloshing around in a large tank. The distances between pairs of walls and between the wall and ceiling dictate how the bass end will behave. At frequencies where the distance between the walls is a multiple of the half wavelength of the bass note, the reflected sound will be 'in-phase' with the direct sound causing peaks & dips in level at various positions throughout the room. These resonant peaks and dips are known as room modes and all rooms exhibit them to some extent. It isn't necessary to follow the maths but just to be aware that room dimensions result in room modes, which in turn cause peaks and dips in the bass response. What's more, it isn't only the basic 'between walls' lateral reflections

So, what can be done about these low frequency problems if a conventional absorber would need to be impractically deep? The most effective place to treat tangential room modes is in the corners of the room where one practical and space-saving option is to use large foam wedges to fill the corner space all the way from floor to ceiling or, if you prefer, the length of the wall/ceiling boundary. Depending on how much bass trapping is needed, you may be able to treat only the front or rear two corners or, in more problematic rooms, as many corner junctions as possible. The reason these wedges don't have to be incredibly thick is that many of the reflections approach them at an angle rather than head-on, so the effective depth of foam encountered by the sound wave varies



from its actual thickness to the full height (or length) of the room depending on the angle of approach. It is virtually impossible to add too much bass trapping so err on the side of too much rather than too little.

## Where to put the Absorbers

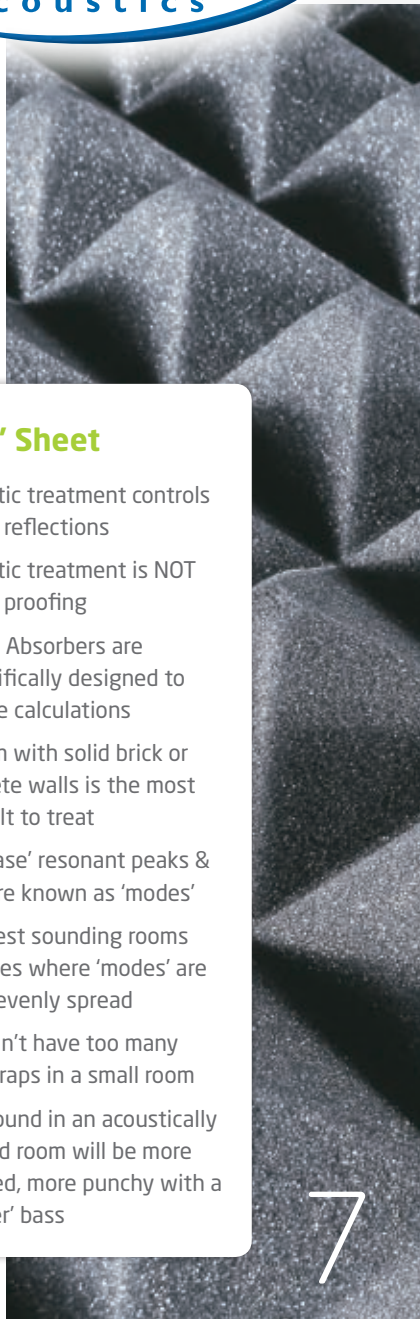
In practice bass traps can go in any corners where you have space to fit them, though keeping the layout as symmetrical as possible around the axis of the speaker system is always good practice.

To work out the position of the panel absorbers, think of the speakers as light sources and the walls as mirrors. You can use a real mirror held flat against the wall to find out where the main reflection points are; if you can see a speaker in the mirror from your normal sitting position, that's the place you need to put an absorber. The main places to treat are the side walls between yourself and the speakers but it also helps to put more absorption behind and between the speakers as well. Unless you have a high ceiling, try the mirror test there too as you'll find a spot that bounces the sound right back to your listening position.

If the rear of the room is very reflective (such as bare painted plaster), covering some of that space with absorbers will help to dry up and focus the sound but irregular-shapes also help break up the reflections so part-filled bookshelves and wine racks are useful allies as are soft furnishing, which act as mid/high absorbers by virtue of their porous construction.

### 'Cheat' Sheet

- ✓ Acoustic treatment controls sound reflections
- ✓ Acoustic treatment is NOT sound proofing
- ✓ Sound Absorbers are scientifically designed to precise calculations
- ✓ A room with solid brick or concrete walls is the most difficult to treat
- ✓ 'In-phase' resonant peaks & dips are known as 'modes'
- ✓ The best sounding rooms are ones where 'modes' are fairly evenly spread
- ✓ You can't have too many Bass traps in a small room
- ✓ The sound in an acoustically treated room will be more focused, more punchy with a 'tighter' bass



# 8 Application & Universal Room Kits



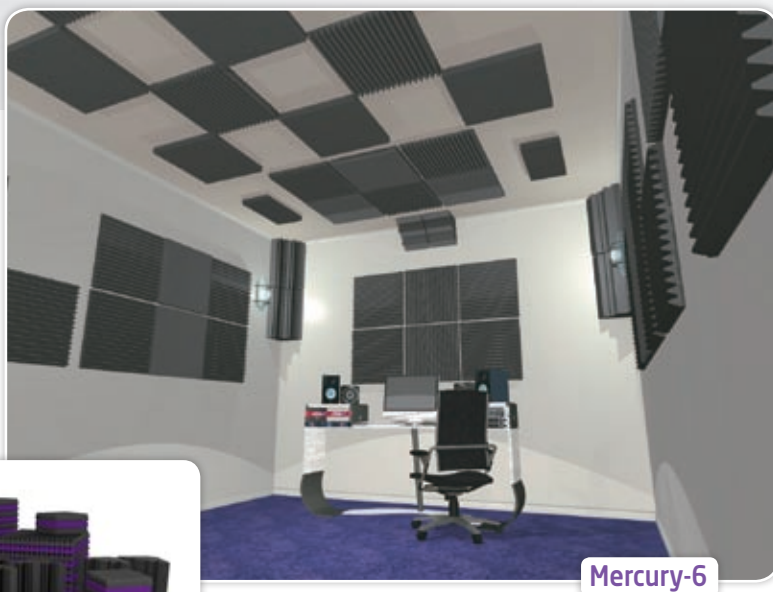
## How to Acoustically Treat Your Room

### Step 1: Corner Bass Trapping

Low frequencies build up in the corners of your room - so that is the best place to attack them with Mercury Bass Traps! Placing 600mm Mercury Bass Trap in each vertical corner is recommended - starting at the ceiling. The 300mm Mercury Bass Traps should be placed between wall/ceiling horizontal junction, on the front wall (i.e. the wall you face while mixing) and on the rear wall. If you have doors or windows near your vertical corners that prohibit you from placing Mercury Bass Traps as described, simply place them horizontally along the junctions between the walls and the ceiling as best as possible.

### Step 2: Early Reflection

Reflections that arrive at your ears within 80 milliseconds of the direct sound are summed by your brain and cannot be distinguished as a separate source. This can be problematic during recording or critical listening applications. While sitting at your listening position, have someone move a mirror along the front wall, side walls and ceiling. Anywhere you see the speaker's reflection is a good location for Mercury Wedge Tiles. The halfway point between the speakers and your listening position on the side walls and ceiling will be crucial along with the front wall located behind the speakers.



### Step 3: Ambience Control

The rear portion of the room should be treated as well to control ambience and late reflections. Place Mercury Wedges on the rear wall to absorb the direct sound from the speakers.

The rear portion of the side walls should have staggered treatment - i.e. the pattern that is used for the left wall should be inversed for the right wall. Imagine a checkerboard - red squares on the left wall, black squares on the right wall. Additional panels should be placed on the ceiling in the rear portion of the room.

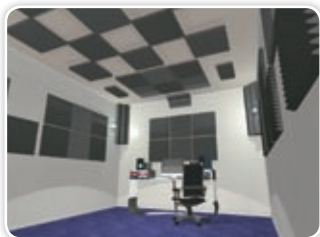
## Universal Room Kits

Universal Acoustics Room kits are made up from the Mercury range of tiles, based on the size of the room to be treated. There are currently nine kits available and the table on page 11 shows what comes with each kit, including all the required glue. Kits can be purchased as all Charcoal or a mix of Charcoal and Purple or Charcoal and Burgundy tiles.



# 10 Universal Room Kits

All Mercury Room Kits are available as Charcoal,  
Charcoal/Burgundy or Charcoal/Purple



## Mercury-6 Room Kit

- ✓ 40 x Mercury Wedges 50mm-300x300
- ✓ 40 x Mercury Wedges 50mm-600x600
- ✓ 4 x Mercury 300 Bass Traps
- ✓ 8 x Mercury 600 Bass Traps
- ✓ 5 x Space Mist 500ml



## Mercury-5 Room Kit

- ✓ 40 x Mercury Wedges 50mm-600x600
- ✓ 4 x Mercury 300 Bass Traps
- ✓ 8 x Mercury 600 Bass Traps
- ✓ 3 x Space Mist 500ml



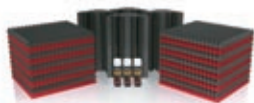
## Mercury-4 Room Kit

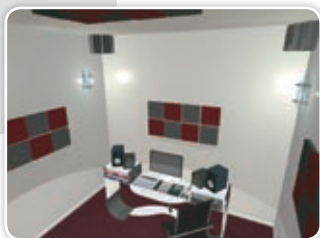
- ✓ 20 x Mercury Wedges 50mm-300x300
- ✓ 30 x Mercury Wedges 50mm-600x600
- ✓ 2 x Mercury 300 Bass Traps
- ✓ 4 x Mercury 600 Bass Traps
- ✓ 3 x Space Mist 500ml



## Mercury-3 Room Kit

- ✓ 20 x Mercury Wedges 50mm-600x600
- ✓ 4 x Mercury 600 Bass Traps
- ✓ 2 x Space Mist 500ml





### Mercury-2 Room Kit

- ✓ 40 x Mercury Wedges 50mm-300x300
- ✓ 4 x Mercury 300 Bass Traps
- ✓ 2 x Space Mist 500ml



### Mercury-1 Room Kit

- ✓ 20 x Mercury Wedges 50mm-300x300
- ✓ 2 x Mercury 300 Bass Traps
- ✓ 1 x Space Mist 500ml



### Pluto-1 Room Kit

- ✓ 24 x Mercury Wedges 50mm-300 x 300
- ✓ 1 x Space Mist 500ml



### Neptune-2 Room Kit

- ✓ 10 x Neptune Wedges 30mm-600x600
- ✓ 2 x Neptune 600 Bass Traps
- ✓ 2 x Space Mist 500ml



### Neptune-3 Room Kit

- ✓ 20 x Neptune Wedges 30mm-600x600
- ✓ 4 x Neptune 600 Bass Traps
- ✓ 2 x Space Mist 500ml



# 12 Frequently Asked Questions

**Q: Will a Room Kit stop sound from leaving or entering my room?**

**A:** No. Acoustical treatment is not designed to stop sound. A construction process is needed to block sound from travelling from one space to another. Universal Room kits will improve the quality of the sound within the room, but will not block it from leaving.

**Q: What should I expect to hear after the Room Kit is installed?**

**A:** You should expect a more accurate sound - more consistent low frequency response, less reflected energy. Your recordings should sound more controlled and professional and your mixes should translate better to other systems.

**Q: I like what I hear. Is there anything else I can do to improve my setup?**

**A:** Yes. The next step would be to place additional Mercury Bass Traps to the vertical and horizontal corners of the room. You cannot have too many bass traps in a small room, so adding bass traps will only improve your low frequency response. If you desire more control, additional Mercury Wedges could be added as well. Also, it would be beneficial to install Universal Acoustics Vibro-Pads - specially formulated anti-compression pads designed to improve the accuracy of your near field monitors by isolating and de-coupling them from the surface they are resting on.

**Q: Universal Acoustic foam products come in a choice of colours but none of them suit my room. Can I cover them in fabric?**

**A:** Yes as long as the fabric will allow sound to pass through (test it by blowing through it) and it meets any applicable fire safety regulations.

**Q: The spray adhesive used to fix these panels looks somewhat permanent. How else can I fix up the panels so that they can be removed without damaging the walls?**

**A:** You can hang the flat panels on the wall much like picture frames. Using the spray glue, you can stick a thin strip of wood (or even an old CD) to the back of the panel, near the top edge, then simply hang this on a picture hook. The bass corner traps are heavier so the best non-permanent solution would be to screw some thin plywood, hardboard or MDF to the wall where the traps need to be glued. You can then glue the traps directly to the plywood. When you come to remove them, you'll only be left with the screw holes needed to secure the panels. Ceiling panels can be suspended from chains or nylon cord. A simple and tidy way to do this is to make a wooden frame for the panel, (leaving the top and bottom surfaces exposed), then use this to fix the necessary hooks. The foam is so light that conventional drywall fixings can be used in the ceiling.



## Which Room Kit is Right for My Room?

Room Kit	Wedge 300 x 50mm	Wedge 600 x 50mm	Bass Trap 300mm	Bass Trap 600mm	Space Mist Glue	Coverage*
<b>Pluto-1</b>	24				1	2.20m <sup>2</sup> / 24.00ft <sup>2</sup>
<b>Neptune-2</b>		10		2	2	3.60m <sup>2</sup> / 39.00ft <sup>2</sup>
<b>Neptune-3</b>		20		4	2	7.20m <sup>2</sup> / 77.50ft <sup>2</sup>
<b>Mercury-1</b>	20		2		1	1.80m <sup>2</sup> / 20.00ft <sup>2</sup>
<b>Mercury-2</b>	40		4		2	3.60m <sup>2</sup> / 39.00ft <sup>2</sup>
<b>Mercury-3</b>		20		4	2	7.20m <sup>2</sup> / 77.50ft <sup>2</sup>
<b>Mercury-4</b>	20	30	2	4	3	12.60m <sup>2</sup> / 136.00ft <sup>2</sup>
<b>Mercury-5</b>		40	4	8	3	14.40m <sup>2</sup> / 155.00ft <sup>2</sup>
<b>Mercury-6</b>	40	40	4	8	5	18.00m <sup>2</sup> / 194.00ft <sup>2</sup>

## Cluster Kits



Cluster Kit	Mercury Wedge 300 x 50mm	Jupiter Wedge 300 x 50mm	White Diffuser 300mm	Cosmic Fluid Glue	Space Mist Glue	Coverage*
<b>Mercury Cluster Kit</b>	14		6	1	1	1.80m <sup>2</sup> / 20.00ft <sup>2</sup>
<b>Jupiter Cluster Kit</b>		20	6	1	1	2.34m <sup>2</sup> / 2.52ft <sup>2</sup>

\* It is recommended you cover the top 2/3rds of the wall with 40-50% coverage

# 14 Product Line-Up

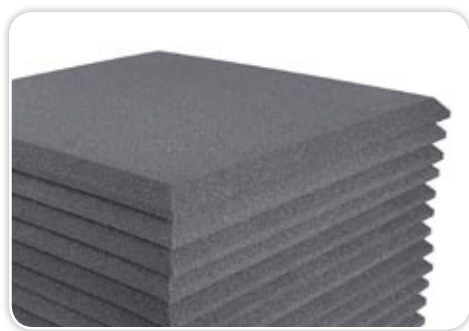
## Acoustic Tiles

Universal Acoustics offers 5 different types of tiles, each with a different profile. Universal Acoustics absorption tiles are easy to install on most surfaces using either Space Mist adjustable nozzle spray adhesive or Cosmic Fluid liquid adhesive. These can be glued directly to wall surfaces or ceilings or if preferred can be glued on to conveniently sized panels which may be hung or suspended as required. With this method they can be easily moved around or to a different location.



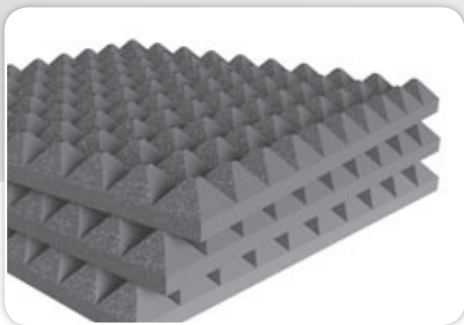
50mm thick tiles should normally be used to treat most small to medium sized rooms or workspaces but 100mm thick versions should be considered to treat larger spaces such as rehearsal studios, places of worship, concert halls etc or areas where a more pronounced low frequency is evident.

For full technical specifications, performance data and fire ratings, please visit [universal-acoustics.com](http://universal-acoustics.com)



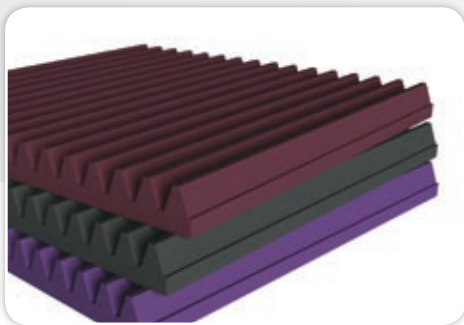
### Neptune Flat

Neptunes have a 100% flat surface profile providing excellent absorption within a very low profile format (only 30mm) and feature an attractive contour bevel on all 4 sides. Neptunes are our most cost effective design yet and provide great performance for an average 25% less cost than our other designs. Also available as Bass traps and in two new low cost Room kits. Available in Charcoal only.



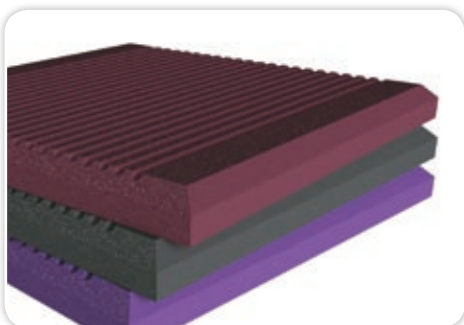
## Saturn Pyramid

The Saturn Pyramid style is designed to give a striking finish to your acoustically treated space. It has great absorption properties but spacing them out can also aid diffusion. They offer up a large surface created by the pyramid shape. Using a combination of both 50mm and 100mm tiles gives excellent absorption and can help room problems such as flutter and echo.



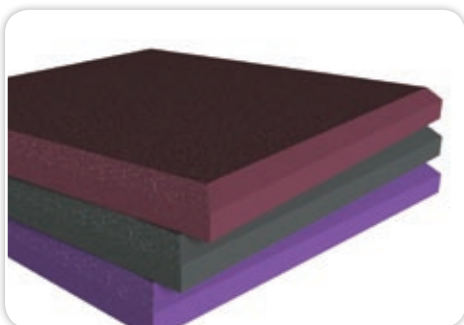
## Mercury Wedge

The Mercury our most popular style and is used in all our Mercury Room Kits, with its distinctive trough and peak design, offers an economical solution for room treatment. As well as great absorption qualities the wedge design also offers some help with flutter and echo. Whilst primarily designed for absorption, spacing them out and rotating the angle can aid diffusion also. You can also mix 100mm and 50mm tiles to excellent effect.



## Jupiter Wedge

The Jupiter wedge tile, with its fluted groove finish, offers a premium solution for room treatment, but maintains an attractive look. It has excellent absorption properties. If you are looking for absorption of mid and high frequencies but wish to use a tile with an interesting design, these are for you. Matching styles Jupiter Bass traps are available.



## Jupiter Flat

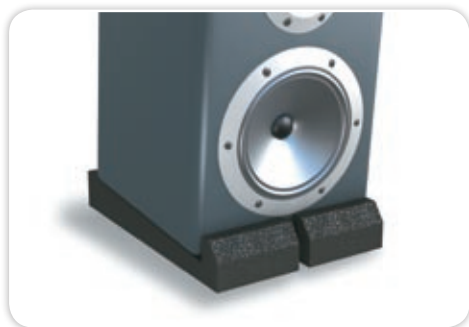
The Jupiter flat tile is a highly functional tile and provides a premium solution for room treatment. It has unmatched absorption properties due to optimum thickness throughout the whole tile. If you are looking for superior absorption of mid and high frequencies then you cannot choose a better tile than the Jupiter flat.

# 16 Product Line-Up



## Bass Traps

Universal Acoustics bass traps come in three styles and sizes. They can be purchased in 300mm or 600mm lengths and in Mercury, Jupiter, or Neptune style. Bass traps treat problematic bass frequencies that can amplify in corners. They can be used in wall to wall and ceiling to wall corners to help control the 'boominess' often caused by the room mode effect. The Mercury bass trap offers an economical and practical solution while the stylish solid fluted front profile Jupiter bass trap provides slightly higher absorption.



## Speaker Vibro Pads

Made from specially formulated, high load bearing foam, which makes them harder and denser than competing products. Foam can feel hard when it is actually stiff. UA Vibro-Pads are less stiff and therefore less susceptible to fatigue when carrying heavy loads. This makes them the best product on the market for effective, long-term isolation of all types of studio monitors. Each set includes 4 pads with individual levelling adjuster providing a 5° or 10° slope to angle the speaker up, down or flat for optimum listening position.

## Adhesives

Formulated to provide the perfect solution for mounting acoustic foam materials to virtually any type of substrate/material in a professional or domestic environment.



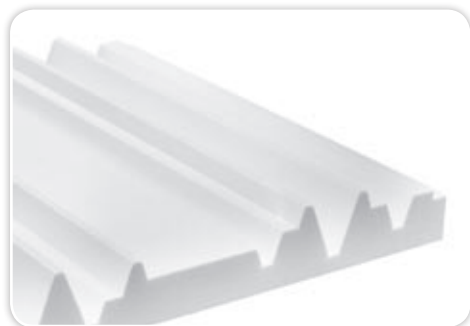
### Cosmic Fluid - Gun Glue

A professional quality, gun grade, high bond strength, synthetic rubber/resin with quick initial grab and good gap filling properties. Safe and easy to apply from cartridge with a caulking gun.



### Space Mist - Spray Glue

Fast drying & easy to use high strength bond which has good ageing characteristics. Especially developed for acoustic foam materials, and used in our Room Kits, Space Mist is a high strength aerosol adhesive with the advantage of a variable spray width button.

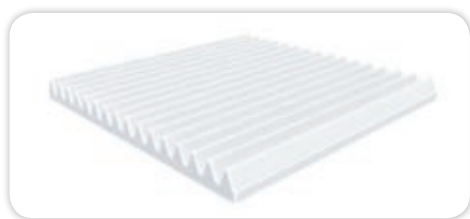


## Basotect

The Universal Acoustic Architectural Range is perfectly suited for installations in public spaces. Made of Basotect, a lightweight material demonstrating excellent acoustic properties, and used for architectural applications when a higher degree of fire resistance is required; typically in large areas or public building spaces.

They are a Class-O surface as defined in paragraph A12B of Building Regulations document B and achieve BS476 part 7 Class 1 and B476 part 6 Pass.

Available in WHITE only. Mercury 600 x 600 x 50 mm tiles plus 600mm and 300mm Jupiter or Mercury bass traps.



## Diffusers

UA Mercury Diffuser / Reflectors are available in 300mm and 600mm square sizes.

Their flat surfaces are 50mm thick but include peaks and dips between 20mm and 80mm high to achieve their hard surfaced diffusion properties. They are made from Flame Retardant EPS (Expanded Polystyrene) to Class 3 fire specification and finished in standard white. They can be painted with water based emulsion for visual purposes without affecting the sonic performance.

Diffusers are gaining popularity as a low cost solution for creating a more open or lively characteristic within a small or dull sounding room. UA diffusers can be mounted in clusters independently or combined with all UA absorption tiles and can offer noticeable benefits especially when ceiling mounted over the mix position.

The specially designed Mercury Diffuser surface provides redirection of sound waves while maintaining sonic energy in your audio environment.

# 18 Home Entertainment

## Home Cinema Treatment

Our carefully engineered range of Cinema acoustic treatment panels combines elegant aesthetics with excellent frequency absorption to improve the audio integrity, intelligibility, performance and dynamics of any room. Available in a variety of finishes and fabrics to satisfy any Interior Designer they are supplied with easy install fitting kit and instructions.

### Why Use Eclipse?

Audio professionals know that a room with 'naked' walls will cause the sound waves to bounce around the space, reflecting off the walls and reaching the listener's ears at different time intervals. This causes bass notes to sound muddy, too loud or too quiet, a lack of focus in mids and highs and vague stereo imaging where it becomes difficult to tell where the sound is supposed to be coming from.

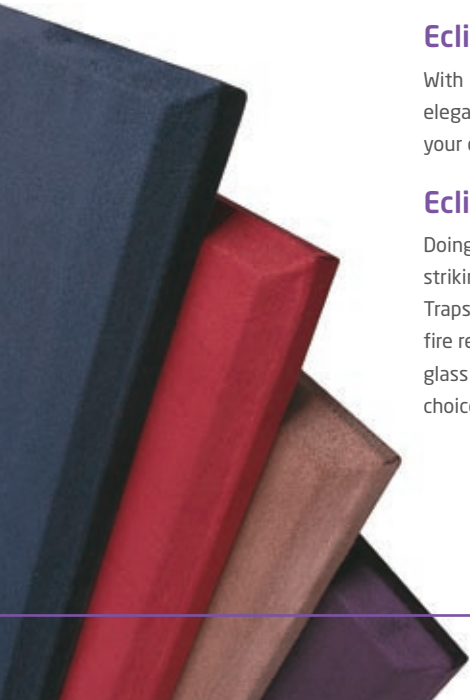
Developed by a team of experts responsible for the acoustic design and construction of hundreds of commercial recording studios, this new range of acoustic treatment panels control unwanted sound reflections, dramatically improving the sound of your home theatre / room, resulting in a more pleasurable listening and viewing experience.

### Eclipse Faux Suede Wrapped Panels

With an attractive suede fabric finish and bevelled edges, these elegant acoustic panels are available in range of colours to match your decor and measure 600 x 900 x 25mm.

### Eclipse Bass Trap

Doing an essential job and offering a striking contemporary design, Eclipse Bass Traps are manufactured from high density fire retardant polyester foam with a fibre glass core and covered in a choice of suede fabrics.





# ECLIPSE

*“A more pleasurable listening and viewing experience.”*

## Eclipse Specifications

### Eclipse Suede Fabric Panel

Dimensions: 600 x 900 x 25mm

Construction: High Density Fibre Glass Core

Covering: High Class Faux Suede

Fire Rating: Class 1

### Eclipse Bass Trap

Dimensions: 900 x 370 x 170mm

Construction: High Density Acoustic Foam with Fibre Glass Core Front

Fire Rating: Class 1 - UL94 HF1



For full technical specifications, performance data and  
fire ratings, please visit [universal-acoustics.com](http://universal-acoustics.com)

Version-03-12

[www.universal-acoustics.com](http://www.universal-acoustics.com)

Universal Acoustics

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