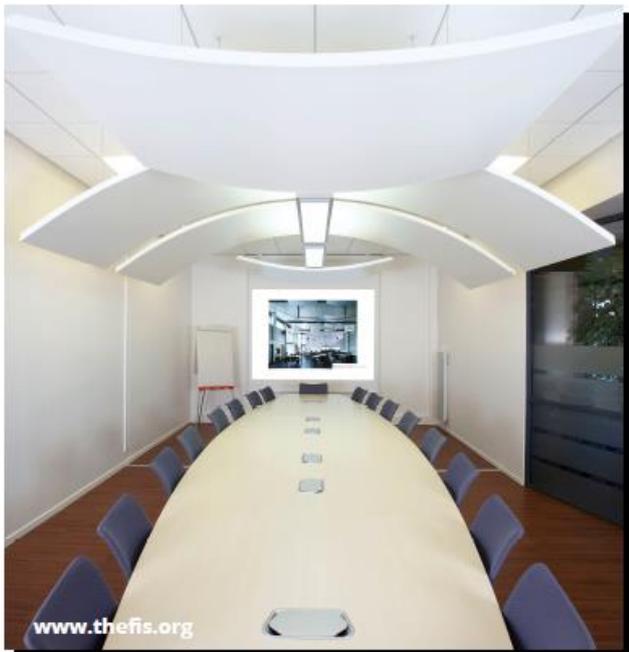


**FIS**

FINISHES & INTERIORS SECTOR

**SPECIFIERS GUIDE**

Ceilings and Acoustic Absorbers



Proposed  
Specifiers Guide  
**Suspended  
Ceilings and  
acoustic  
absorbers**

*Supporting skills and  
knowledge across the  
sector*

## Specifiers guide Ceilings and absorbers

This Draft has been issued for peer review. Note that this is a draft and not a typeset document so please do not comment on matters of typography and layout.

Please add any general or technical comments on the comment sheet which accompanied this invitation.

Please do not add comments/sticky notes to this guide as they may not be reviewed.

DRAFT

# Specifiers guide Ceilings and absorbers

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# Specifiers guide Ceilings and absorbers

## Introduction

The purpose of this publication is to highlight and guide you through some of the key criteria that should be taken into account when writing a specification for a suspended ceiling or acoustic absorber.

Guidance is provided on the generic types of continuous and discontinuous ceilings and the performance standards shown in BS EN 13964 (Suspended Ceilings: - Requirements and Test Methods) and regulations that may apply.

A well written specification not only ensures the installation meets the client's requirements, it also means the specifier's requirements are less open to interpretation and prices at tender stage are more accurate and ensure then performance requirements are compliant.

## Scope

This Specifiers Guide has been produced to assist the selection and specification of a suspended ceiling and acoustic absorbers for internal applications. Its aim is to help you select a ceiling or acoustic absorber that will satisfy the performance needs of the room or space whilst providing the desired visual effect.

It is not a definitive list of standards, regulations or product types. Importantly it is not a replacement for professional consultation on critical performance requirements or discussions with manufacturers on specific product use.

Ceilings should be specified, procured, supervised, installed and maintained by people who are competent.

This guide is primarily aimed at:-

- Architects
- Specifiers
- Interior designers
- Specialist ceiling installers
- Complimentary trades
- Those who have or are about to have a ceiling installed

# Specifiers guide Ceilings and absorbers

## The Specification

### What is a specification?

A specification is a detailed description of the dimensions, construction, workmanship, materials etc., of work done or to be done on a project, prepared by an architect, engineer or designer, often referred to as specifiers.

### Top ten tips to specifying ceilings and absorbers

On your next project, don't be tempted to cut and paste from the last project, but take a fresh look and see for yourself the benefits of following this simple guidance.

These are the 10 or actually 11 key points that we think will help you write a smart specification

1. Talk to the manufacturer
2. Performance is king (Fire, Sound etc.)
3. Consider the interface with other elements / junctions
4. Understand the use/now and the future
5. Understand the budget
6. Understand the programme and site conditions
7. Understand the vision and client aspiration
8. Ensure the performance and workmanship requirements and standards are clearly included.
9. Understand the implications of maintenance
10. Understand the environmental implications and what will happen at end of life
11. Do not be scared of specifying new products.

### 1 Talk to the manufacturer

Manufacturers have the expertise the competency and the relevant test evidence to interpret your designs to the most cost effective solution to meet all aspects of the brief, and they can help develop solutions to meet specific requirements.

### 2 Performance is king

Performance is probably the most important aspect of a specification (Fire Sound etc.) Performance is key to getting a smart specification. A product may look great, and be under budget, yet it will be useless if it can't perform in the way you want.

It's important that you convey the performance requirement unambiguously stating what standard the product should have been tested to, and specify systems not individual products that may not have been tested together.

In Building Regulations Approved Document B it states that the person specifying a product is responsible for ensuring it complies with this building regulation.

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## 3 Consider the interface with other elements and junctions

It has been said that the edge is the most important element of a construction project, and therefore the interaction of elements is crucial, and the tolerance of the elements that you are abutting.

## 4 Understand the use/now and the future

As operational and work practices are changing rapidly to accommodate a new agile workforce; a flexible approach may be required to lighting and service positions which should be considered during the specification.

## 5 Understand the budget

Budgets will vary greatly from project to project depending on the performance levels required on the installation in question. Specifiers can make their budget work harder for them by speaking to a specialist, experienced contractor who should be able to suggest where cost savings can be made without compromising the end result.

## 6 Understand the programme and site conditions

Of course, whilst careful planning and budgeting can account for most things, the availability of the selected system can hold up the completion of the project.

## 7 Understand the vision and client aspiration

This can be in terms of aesthetics, or how the space works. For example, can I hold a private meeting or can my teams work collaboratively, is it a good acoustic space?

## 8 Ensure the performance and workmanship requirements and standards are clearly included.

Specifying a product is only halfway there if you don't state the standard of workmanship and quality that's expected at handover, this is particularly important where you are specifying finishes.

There are a number parts of British standards BS8000 that refer to workmanship on site, and we always recommend asking for a benchmark to allow the rest of the work to be measured against.

## 9 Understand the implications of maintenance

A product in a high traffic area will undoubtedly require a different maintenance regime to say a boardroom. Products that can meet the need with minimum maintenance and cost should be a first choice

## 10 Understand the environmental implications and what will happen at end of life

Specification considerations may in some cases be steered by the company's CSR or environmental policy statement. As a result, the need to meet these requirements can result in a very specific solution being needed – meeting a good BREEAM or SKA Rating for example can impact the initial specification process.

## 11 Do not be scared of specifying new products. That's how new products are developed.

Remember products must be Equal AND approved not Similar/equal OR approved

Remember that the person specifying a performance product to meet the requirements of the Building regulations is responsible for ensuring they comply; so any alternative should be **Equal** and should be **Approved** by the specifier

# Specifiers guide Ceilings and absorbers

## Writing a specification

In order to provide a clear and unambiguous statement of what is required, a specification should be produced by the designer/ specifier and ideally with assistance from the manufacturer.

### What's included and what's not included in a specification?

Populated by the specifier, a specification document describes in words what cannot be visualised or explained on a drawing or model. This document can be incredibly wide-ranging - covering the establishment of the site, the type of contract to be used, the performance criteria of the asset, the quality of the systems and products, which standards are applicable and how they should be executed, and even the products to be used.

Specifications do not include information on cost, product availability, quantity or drawn/visualised information so need to be read in conjunction with documents detailing quantities, schedules and drawings. For this reason, if a product is unavailable and a substitution is required, the specification document should be adhered to when choosing an alternative.

Source NBS Website [HERE](#)

### Types and Advantages of writing a specification

The production of a specification should happen in tandem with design work - with ever greater level of detail added as the design progresses.

At tender stage, the outline specification serves as an essential reference guide for clients and for contractors looking to price the project.

By defining what is expected in a performance specification it allows manufacturers to offer similar or more innovative solutions as well as acting as a design brief for specialist sub-contractors involved in the tender process.

The full specification should provide a detailed description of the product and/or systems in relation to the specific project and include the performance levels required.

### How should specifications be structured?

The structuring of specifications will vary from project to project but should reflect the work packages on a particular project and any sub-contracts. This structuring should make it easier for contractors to price a job and provide a more accurate tender.

The use of a standard classification system, such as Uniclass 2015, is encouraged as it should reduce the potential for confusion or ambiguity.

Leaving specifications until the last minute - when production information is being prepared - is not to be advised.

## National Building Specification (NBS)

NBS provide libraries of pre-written clauses; guidance on regulations/standards and manufacturer product information. To ensure consistency, these are all written by their in house team and cover virtually all aspects of building design.

They are accessed through the NBS subscription service that have been developed over a long period of time. Starting out as NBS Clauses the basic versions have been updated and added to with NBS Create and now NBS Chorus.

# Specifiers guide Ceilings and absorbers

Each main clause is followed with a number of sub clauses \*\* to refine the type of ceiling /absorber/product.

## NBS Building Ceiling clauses

- K10 \*\*\*
- K40 \*\*\*

## NBS Create

- 20-10-10\_\*\*
- 

## NBS Chorus (Uniclass 2015)

- Ss 30 25 10 -\*\* Board and sheet ceiling systems (\*\*with more defined sub clauses)
- Ss 30 25 22 - \*\* Demountable suspended ceiling systems (with more defined sub clauses)

It is important that manufactures are consulted on projects. This will help to ensure that what you write in your specification is what will be installed on site. Most will also be more than happy to not only help you write the specification but also build in performance, regulatory and any other requirements that should be taken into account when pricing or installing the ceiling system.

Although the manufacturer can draft a specification for consideration, the designer/ specifier is ultimately responsible and accountable for ensuring the final specification is compliant and in line with the project requirements and meeting the building Regulations.

## Design Considerations

**Application** – Identify the main characteristics that your ceiling should provide for the use of the space:

- **Aesthetics** – to make a visual statement
- **Satisfy performance requirements** for specific applications with important requirements such as:-
  - **Health/Clinical** –
    - MRI rooms– only non -ferrous products
    - Anti-ligature ceilings – prevention of self-harm and suicide in hospitals and prisons
    - Pathology – smooth ceilings that can be easily cleaned and disinfected
    - Wards / streets – pleasant quiet environments
  - **Educational** – making sure the environmental and acoustics are fit for purpose
  - **Cinemas** – requirement for mass barrier construction and acoustic control
  - **Clean rooms** – strictly controlled environments using compatible products
  - **Sports hall** – acoustics / ball impact

# Specifiers guide Ceilings and absorbers

- **Swimming pool** – ensuring the installation components meet the need for corrosion resistance
  - **Thermal mass construction** - ensuring airflow matches the M&E requirements
  - **Environmental accreditation schemes**- ensuring the project meets the environmental and CSR of the client
- **Wall/partition/ceiling interface**
  - **Integration of services** into the ceiling void (lighting, sprinklers, air conditioning, smoke detectors Wi-Fi)

Whichever selection is made there will be a number of key performance criteria that must be met, some that need to be met to ensure the space is fit for its intended purpose and those that are desirable but not essential.

*NOTE: Under CDM the designer is responsible for ensuring the installation can be delivered and is safe. A designer must take account of pre-construction information the client or principal designer provides when making decisions about the extent to which they can eliminate foreseeable risks through the designs they produce; and, where these risks cannot be eliminated, the steps they take to reduce or control them.*

*When designing, a designer must consider the risks people may be exposed to through the course of both constructing a building and using it once it is constructed.*

## Performance

This section outlines some of the performance characteristics that ceiling systems and acoustic absorbers can provide. The performance tests for most suspended ceilings are specified in BS EN 13964 (Suspended Ceilings: Test Requirements and Methods).

N.B. Stretch ceiling are covered by BS EN 14716.

### Fire

To be valid, both Reaction to Fire and Fire Resistance tests must be carried out by a UKAS\* or “Notified\*Body” test laboratory that is authorised to conduct and issue test report in accordance with the specific test Standards.

\*EN tests to be carried out by a Notified Body

### Reaction to Fire

Reaction to fire is the measurement of a materials contribution to the development and spread of fire, generation of smoke and the production of flaming droplets. All are major factors in the rate of development of a fire and thereby the risk to people and property. With the exception of A1 non-combustible, ceiling products have a classification with three references e.g. “A2-s1, d0” (se fig x)

Reaction to fire is classified under BS EN 13501 -1. Products are tested using a number standards dependent on their predicted performance.

# Specifiers guide Ceilings and absorbers

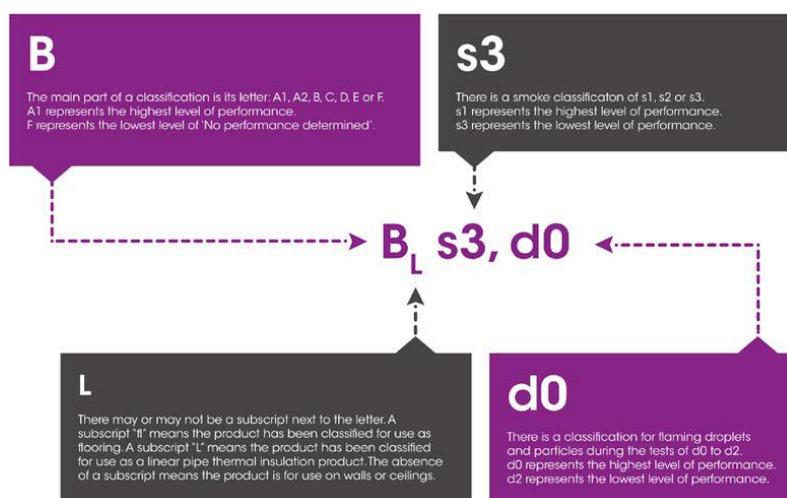


FIG x explains the classification system under BS EN 13501-1

The required “Reaction to Fire” classifications for materials used in commercial buildings are shown in [Approved Document B, Volume 2](#)

Reaction to Fire is a material test and as such the tests are carried out under very strict criteria.

## Fire Resistance.

Whilst the criteria for Fire Resistance tests are also very specific, there are many more variables that can be included in the structural test construction that can influence the achieved performance. Variable items such as the type of floor, the void depth, hanger centres, load, and etc. will all effect the test result and performance when installed in the project.

It is therefore very important not only to obtain a copy of the test report but to ensure that the tested construction applies to your project and to include that test report in your specification. It is also critical to ensure that it is installed in accordance with that test report.

Similarly if other elements are included in the ceiling such as lights, speakers etc. make sure the suggested method of providing continuance of the required level of fire resistance has been tested and / or assessed to the same standard.

There should also be no additional loads applied to the ceiling unless mitigated by installing sufficient additional or independent hangers to support the load. This should be included in the assessment.

Fire resistance is shown in the test report as minutes, REI30 (30 minutes), REI60 (60 minutes) etc. This refers to the ability of the whole construction to satisfy the REI loadbearing capacity (**R**), Integrity (**E**) and Insulation (**I**). The whole test construction would be made up of the floor assembly, suspended ceiling, any services included in the ceiling plane and a floor load where applied.

All this information should be shown in the test report

Ceilings are also tested for EI, Integrity (E) and Insulation (I)

# Specifiers guide Ceilings and absorbers

## Compartmentation

Where compartmentation is required a ceiling alone is not able to provide the required REI fire resistance. The floor construction, including the suspended ceiling should be considered as a whole i.e. the structural floor, ceiling and penetrations as long as there is supporting test evidence showing that the floor and ceiling constructions is capable of providing the required REI performance.

*NOTE: The ceiling should not be easily demountable and, depending on the type of ceiling system, may require positive clipping to prevent tiles being removed. Where access into the void is required lockable, fire rated access traps should be provided. These should be compliant with the ceiling system and have test evidence to support their use. Similarly any services or penetrations should provide the same level of fire resistance as the ceiling. See Building Regulations [Approved Document B, Volume 2](#) for compliance requirements.*

## Cavity barriers

The provision of appropriate vertical or horizontal barriers installed to restrict the spread of smoke and flames through cavities. See Building Regulations [Approved Document B, Volume 2](#)

## Fire stopping

The provision of seals to restrict the passage of fire and smoke through penetrations in a fire resistant elements. See Building Regulations [Approved Document B, Volume 2](#)

## ACOUSTICS [\(see also FIS Guide to Office Acoustics\)](#)

### Room Acoustics

To ensure that the room acoustics are fit for purpose the level of reverberation within the room such as classrooms, lecture halls needs to be controlled.

### Reverberation

The optimum reverberation time for a room or space is dependent on its intended use be it office, conference room, classroom, cafeteria, cinema or library.

Measured in seconds, reverberation time (RT) is defined as the time taken for a generated sound to decay by 60 dB once the sound source has been stopped.

Measurement of the rooms RT and any subsequent calculations will be dependent on a number of the room's physical attributes. The dimensions and shape of the room, the construction and materials used for the interior surfaces and the type and position of any other materials or objects used in the room. Surface materials and objects with good, proven levels of sound absorption will reduce reverberation time.

As well as providing the right balance between reflection and absorption, the selection quantity and positioning of sound absorbing materials are key factors in achieving the correct reverberation time for the rooms intended use. Acoustic products in the ceiling and upper parts of the walls provide a more consistent level of absorption/reflection as they are free from obstructions such as desks, chairs, furniture, etc.

### Sound absorption

Measures the amount of sound energy absorbed by a material and is one of the most important performance considerations in the acoustic design of a room.

Materials are tested for their ability to absorb sound by being placed in a reverberation chamber and tested in accordance with EN ISO 354. The test is carried out over 18 separate frequencies from 100 Hz to 5000 Hz and the results reported individually as sound absorption coefficients ( $\alpha_s$ ) between 0.00 (total reflection) and 1.00 (total absorption).

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*NOTE: Whilst being tested to the same ISO standard, Continuous ceilings and Discontinuous ceilings (acoustic absorbers/rafts/islands, wall absorbers, etc.) are tested using a different layouts, reflecting the way they are each normally used in a room setting*

Continuous ceilings are tested in a closed frame of 10-12m<sup>2</sup> with the ceiling and frame height set at the declared overall depth of system (o.d.s.) shown on the test report.

To allow simple comparison of products, the sound absorption performance is also shown as an  $\alpha_w$ , a single, weighted sound absorption coefficient figure between 0 and 1. This single figure result is also used to place the material in one of the absorption classes shown in table \*\*

Class	A	B	C	D	E	Not Classified
$\alpha_w$ value	0.90, 0.95, 1.00	0.80, 0.85	0.60, 0.65, 0.70, 0.75	0.30, 0.35, 0.40, 0.45, 0.50, 0.55	0.15, 0.20, 0.25	0.00, 0.05, 0.10

Discontinuous ceilings, islands baffles, rafters, discontinuous wall linings and acoustic absorbers (also known as discrete objects) are tested individually using a number of units at a time to provide a more accurate level of performance. An important inclusion on the test certificate is the “distance between the exposed surface of the test object and the nearest room surface”. As this distance can make a significant impact on the absorber’s performance most manufacturer test a range of distances.

The test results are reported for each frequency but unlike a continuous ceiling they are reported as an “Equivalent area per object m<sup>2</sup>” (“A”).

The “Equivalent sound absorption area” (A) is the amount of a chosen product or object that would be required to equal 1 m<sup>2</sup> of a notional material (or open window) that has a sound absorption coefficient ( $\alpha$ ) of 1.00 (100 % absorption) at all frequencies..

*NOTE: As there is no single weighted figure for these results, the best comparison is to calculate the reverberation time for each room or consult an acoustician who will compare products and calculate the quantity you require to achieve the optimum reverberation time in each room. They can also advise on the optimum positioning of the absorbers.*

## Intelligibility

As well as achieving the correct reverberation time, it is important that speech can be understood. To achieve this the room may need some acoustic engineering in placing the correct amount of reflective and absorbent surfaces in strategic places in the room

## Building Acoustics

The reduction or control of airborne sound between adjacent spaces.

# Specifiers guide Ceilings and absorbers

## Flanking Transmission

The measured reduction of airborne sound passing indirectly between two adjacent spaces rather than the main separating element such as a partition or wall. An example of such a construction could be the installation of a partition installed up to the underside of a suspended ceiling, leaving a common void between the rooms either side of the partition. In this instance sound could not only pass through the room partition but also through the ceiling, into the void and back through the ceiling the other side of the partition. Effectively this is the transition of airborne sound through the ceiling twice.

As with sound absorption the construction/ system is tested across a specific range of frequencies to allow professional evaluation for individual projects. For initial comparison a single weighted  $D_{nfw}$  value is shown in the test report and in most relevant manufacturer's literature.

## Sound Reduction Index

A measurement of the separating wall, partition ceiling or floor's ability to reduce the transmission of airborne sound to the adjacent space.

An example of this could be a full height partition with sound generated in one room and the reduction of airborne sound measured in the adjacent room or it could be the reduction of airborne sound from services in the ceiling void to prevent disruption in the room below.

In the laboratory the measurement is based on the absence of flanking transmission and is again measured over a specified range of frequencies to allow professional evaluation.

For initial comparison a single weighted  $R_w$  value is shown in the test report and in most relevant manufacturer's literature.

Where there is a common void the partition / ceiling's ability to reduce airborne sound transmission between adjacent rooms is reliant on the performance of the weakest element.

When looking at product performance figures ensure that you are comparing like for like

**Rain Noise:** Single story and top storey rooms can suffer from the sound generated by rainfall on building elements. This can become so loud that it prevents the rooms from being used for their intended purpose such as teaching. There is a test standard, BS EN ISO 140-18 that measures the acoustic impact of rainfall on roofs, skylights and other building elements. This can also be used to measure a ceiling systems ability to reduce airborne sound generated from rainfall on a building element.

*NOTE: sound insulation figures are measured in a laboratory where the conditions are controlled to enable specifiers to compare products performance.*

*NOTE: As site conditions will vary, an acoustician should be consulted who will interpret the laboratory results and advise on the anticipated-on site performance.*

*NOTE: any penetrations in the ceiling or partition for services will impact the elements ability to perform and it may lead to significant loss of performance.*

# Specifiers guide Ceilings and absorbers

## Structural sound transmission

Structural sound is primarily controlled by isolation and / or the absorption of vibration, suspended ceilings and acoustic absorbers have minimal effect on its reduction. The use of acoustic or hangers can be used to mitigate.

## Other material characteristics

### Volatile Organic Compounds (VOC's).

To achieve credits in most environmental schemes, products which release very low levels of Formaldehyde are required. The current method of assessing formaldehyde content is contained in BS EN13964 and is based on EN 717-1 which has two classifications, E1 release  $\leq 0.124 \text{ mg/m}^3$  and E2 release  $>0.124 \text{ mg/m}^3$ . Other standards assessing formaldehyde and other VOC's are now

### Colour / Gloss.

Where manufacturers show a standard product colour in their literature they will normally qualify the colour and gloss level by stating that it is similar to RAL 9010 or RAL 9005 etc. Where there is an expectation that service elements such as grilles, speaker etc. will be an exact match in colour and or gloss to the ceiling, production samples of each element should be checked.

*NOTE: Ceilings generally provide an uninterrupted surface and are often subject to critical light, minor shade, gloss or background variation may be visible despite being within tolerance.*

### Light Reflectance (LRV).

The total quantity of visible light reflected by a surface at all wavelengths and directions when illuminated by a light source. This is expressed as a figure between 0 and 100, with 0 being absolute black with total absorption and 100 being perfect white providing total reflection.

### Corrosion Resistance

It is important to identify any environmental conditions that will exist during the normal lifecycle of the installation. BS EN 13964 identifies four classes of exposure "A" = Exposure to RH of up to 70% and up to 25° C without corrosive pollutants; "B" = Exposure to RH of up to 90% and up to 30° C without corrosive pollutants; "C" = Exposure to RH of 95% and up to 30° C and accompanied by the risk of condensation but without corrosive pollutants; "D" More severe than preceding classes.

Extreme environments such as swimming pools and other areas that fall into Category D require that the suspension system, infill panels, hangers, top fixings and associated fixings are all specified with products suitable for the conditions and anticipated exposure levels expected during the buildings life. The corrosive elements of the environment may necessitate frequent and regular access into the ceiling void to inspect the ceiling and associated components looking for signs of corrosion.

### Impact resistance

Where a ceiling is installed in a sports, village hall or an area where ball sports are played there is a likelihood of the ball impacting on the ceiling. To provide guidance and a form of classification to help product selection BS EN 13964 provides a laboratory test method and three classifications 1A, 2A and 3A. The classifications are dependent on the speed of the ball.

### Air permeability.

The ability of a product or system to resist the passage of air can be a requirement within operating theatres, clean rooms and laboratories where rooms may require a positive or negative room pressure.

# Specifiers guide Ceilings and absorbers

## Wind Loading/Air tightness

BS EN 13964 identified that interior wind loading/pressure variations can be caused by the normal opening and closing of doors and windows, however the move to more airtight buildings may increase the pressure exerted on ceilings during day to day use. It is therefore important to identify if the risk could occur in your project and if so to what extent. To reduce the possibility of detrimental movement the ceiling system may require more or different hangers, bracing or additional elements to enable the ceiling to resist the anticipated upward/downward loads. Speak with your chosen manufacture for more information.

## Resistance to bacterial / fungal growth Hygiene

Clinical, laboratory and food preparation areas will have specific requirements to resist bacterial and fungal growth.

## Sustainability

Dictionary definition ...able to be maintained or continued:

Extract from an UN document by Dr Brattland in 1987 – “Humanity has the ability to make development sustainable to ensure that it meets the needs of the present without compromising the ability of future generations to meet their own needs.”

Specifiers should request a copy of an environmental product declaration (EPD) to understand the embodied carbon and environmental impacts, as well as understanding how manufacturers are actively engaged in recycling and reducing their carbon footprint.

## Resource Efficiency Action Plans

Many ceiling materials and the off cuts produced during the installation process can be recycled at the end of the project as well as at the end of the project life. Specifiers should discuss this with manufacturers / suppliers during the specification process to ensure the best results.

See the Resource efficiency Action Plan (REAP) for mineral ceilings tiles. [HERE](#)

## Environmental Schemes / Product Accreditations

There are number of environmental schemes around the world whose goal is to assess the impact on our wellbeing and the environment of both construction and use of the project use when completed. Some of these also assess the impact of refurbishment and refit of older projects.

As the realisation of our environmental responsibilities becomes more and more a global concern, many countries have adopted, adapted created their own schemes.

In addition there are also a number of product schemes that analyse products and identify the impact of their production process, sustainability, recyclability and the effect they have on the environment when in daily use.

# Specifiers guide Ceilings and absorbers

## CE marking

Where a harmonised standard exists for a product the Construction products regulation (CPR) places obligations on manufacturers, distributors and importers (known collectively as 'economic operators') of that product when it is placed on the market. The product must have a declaration of performance and have been affixed with 'CE' marking.

In compliance with the Construction Product Regulation (CPR 305/2011), ceiling systems are CE marked according to the European harmonized standard EN13964:2014.

The standard consolidates methods for product testing, product classification and performance declaration for suspended ceilings.

To improve transparency in terms of product performance, CE marked construction products are covered by a Declaration of Performance (DOP) to enable customers and users to easily compare performance of products available on the European market.

## UKCA MARK

As the adoption of [harmonised European Norms](#) is agreed by the European commission, the UK Government are planning to adopt the use of a (UK Conformity Assessed) marking [UKCA](#) mark if there's a no-deal Brexit. The UKCA is a new UK product marking that will be used for certain goods being placed on the UK market. **(NOTE THIS MAY NEED UPDATING BEFORE PUBLICATION)**

## Material types

### Ceilings

Ceilings have grown from a lathe and plaster and basic wood fibre insulation board and to a complex and critical element that can satisfy many of key requirements in today's commercial, health, retail and educational projects. Today our choices are considerably wider and have expanded more to include wall, ceiling and shaped acoustic absorbers.

### Absorbers

Are installed to reduce reverberation as a result of hard surfaces in a space. They are designed to be suspended from the soffit or fixed to the walls and can be installed during construction / refurbishment or retrospectively.

Where a reverberation problem already exists in a room, absorbers can help provide an easy solution. An acoustician should be consulted to identify the problem and advise the correct number of absorbers required and where to place them for the best performance.

### Materials

The table below shows the most common materials used for ceiling systems and sound absorbers. It is not a definitive list and is continuously expanding as manufacturers develop new products to meet the demands of architects and designers.

# Specifiers guide Ceilings and absorbers

Format	Tile	Panel	Plank	Board	Monolithic	Suspension systems	Baffle	Island	Raft	Wall Absorber	3D Shapes
<b>Material</b>											
Gypsum board	✓	✓		✓	✓			✓	✓		
Metal	✓	✓	✓			✓	✓	✓	✓	✓	
High density mineral wool	✓	✓	✓		✓		✓	✓	✓	✓	
Resin bonded stone wool	✓	✓	✓		✓		✓	✓	✓	✓	
Resin bonded glass wool	✓	✓	✓				✓	✓	✓	✓	
Cement fibre		✓		✓							
Calcium silicate	✓	✓		✓							
Magnesium Oxide	✓	✓		✓							
Timber	✓	✓	✓				✓				
Wood wool	✓	✓					✓	✓	✓	✓	
Polyester (PET)	✓	✓					✓	✓	✓	✓	✓
Foam / fabric / wool							✓	✓	✓	✓	✓
Lightweight PVC Stretch fabric		✓			✓			✓			

## Ceiling Systems

A **Ceiling** is defined as a construction covering the underside of a floor or roof, providing the overhead surface for the room or space

A **Suspended ceiling** – a membrane hung by a suspension from or by a directly fixed substructure or perimeter trim to the load bearing structure (floor, roof, beam and walls) at a distance from the floor or roof above

**Continuous ceiling.** A ceiling membrane suspended from the soffit from hangers, with boards, tiles or planks installed to or within a grid that goes from wall to wall.

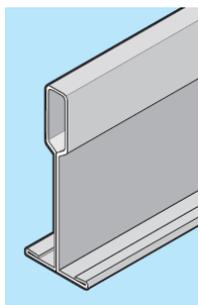
Corridor systems are ceilings designed to be installed between the walls (clear span) with planks/reinforcing profiles supported from specified wall trims. It is important that these systems are

# Specifiers guide Ceilings and absorbers

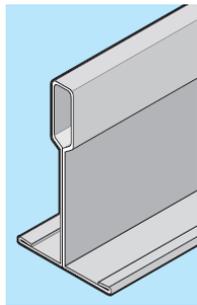
installed correctly and persons removing them for access at a later stage are conversant with the construction of the system and method of removal / replacement.

## Exposed or lay-in grid suspension system

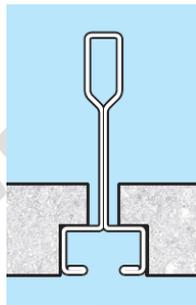
- An inverted tee system with a visible width of 24 mm or 15 mm. Also available with a profiled visible face. Generic systems are based on a 600 x 600 and 1200 x 600 modules
- Standard Bandraaster systems have a wider visible width of 50, 75, 100 and 150 or mm
- "C" Bandraaster, again available in a range of widths but used primarily for metal ceiling systems



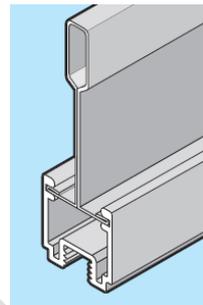
15 mm wide exposed tee



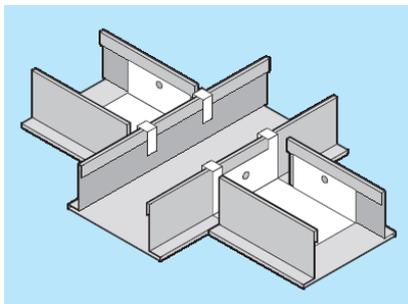
24 mm wide exposed tee



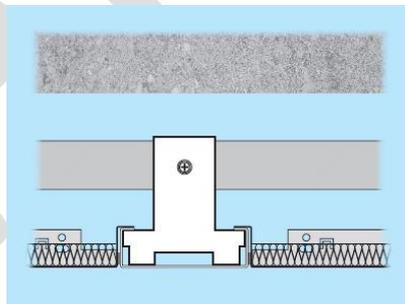
15 mm wide profiled tee



15 mm wide tee with screw thread capping

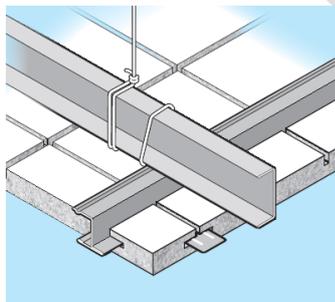


Bandraaster exposed profile



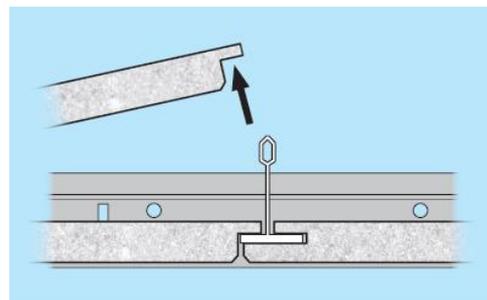
"C" Bandraaster exposed profile

**Concealed suspension systems** where tile, panels or planks are installed onto and conceal the suspension system.



Non accessible system for mineral wool tiles

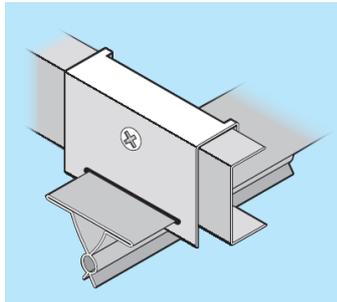
These systems are designed for mineral wool, resin bonded glass wool or stone wool tiles or planks



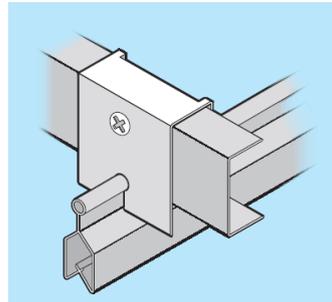
Shiplap demountable system for mineral wool tiles

# Specifiers guide Ceilings and absorbers

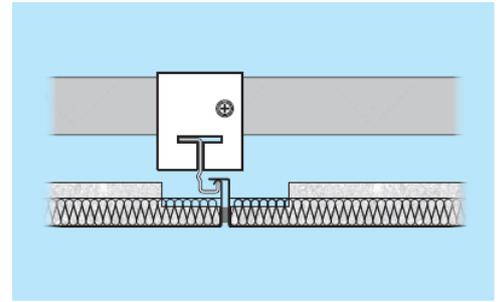
Designed for metal tiles, these systems allow access from below



Spring tee clip-in system for metal tiles



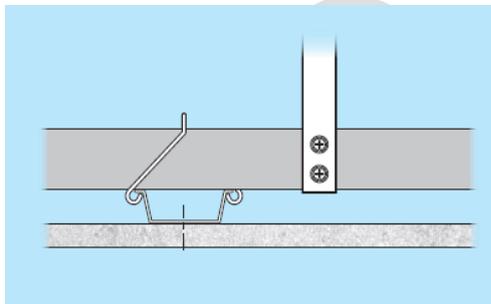
Omega bar clip-in system for metal tiles



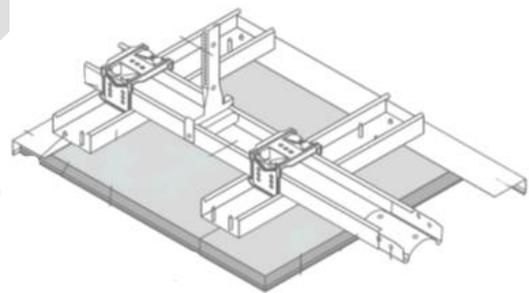
Hook on system for metal tiles

When used in conjunction with encapsulated mineral wool pads perforated metal ceilings can provide high levels of sound absorption and airborne sound reduction

Providing a close to a monolithic finish, both of the following systems can be used for gypsum, mineral wool and resin bonded stone wool boards or panels. The boards are normally screw fixed and the joints concealed. In the case of the gypsum the joints are taped, filled and the whole ceiling then painted or plastered and painted. With the other types the ceiling the boards are again screw fixed, covered with a scrim and the finished with a sprayed mineral finish of a chosen colour.



Metal furring system (MF)



European MF

## Secure systems

MF continuous ceiling systems can provide a secure system with access created by installing proprietary secure access traps.

Metal clip-in concealed systems can be made secure, again with access by propriety secure access traps

Both provide little opportunity for the attachment of ligatures so can be consider for use in hospitals, prisons and police stations.

Some exposed grid systems can be positively clipped to prevent easy access or concealment of contraband.

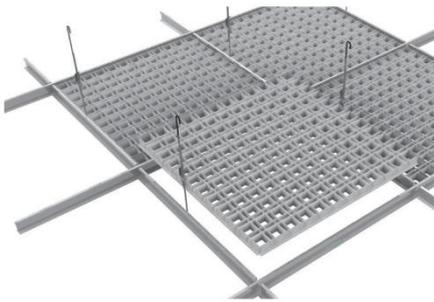
# Specifiers guide Ceilings and absorbers

## Open Cell and open linear ceilings

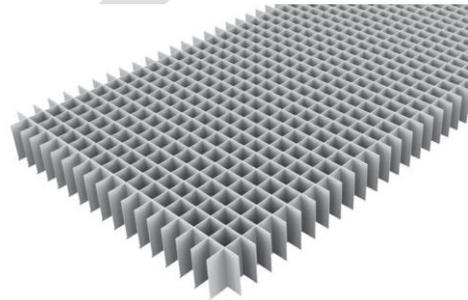
Although visually these ceilings can provide a continuous appearance, they can also be used to provide a varying level of acoustic absorption as well as allow air flow into the void.

Depending on the specific requirements, this can make them suitable for use in thermal mass projects as well as large public areas like shopping complexes and airports aesthetically appealing.

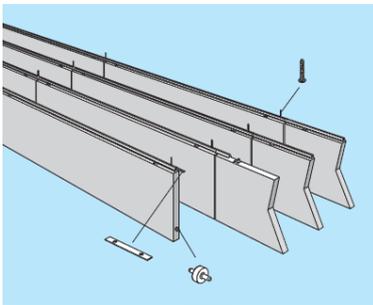
Available in metal, high density mineral wool, GRG ...



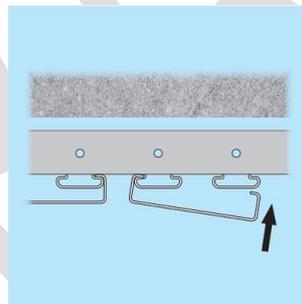
U profile open cell



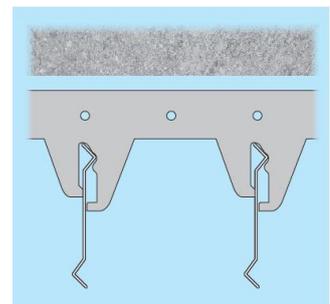
Mono blade open cell



Baffles in a variety of materials



Linear Metal strip



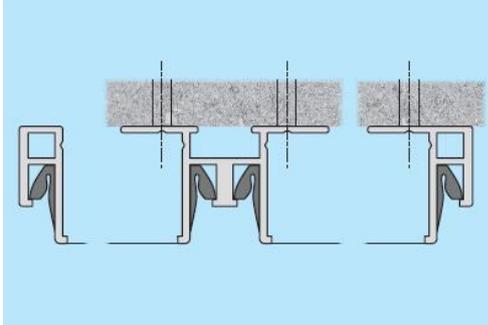
Metal Mono blade



# Specifiers guide Ceilings and absorbers

**Stretch Ceiling** – a fixed perimeter track and a membrane that is stretched and clipped into the track

BS EN 14716 (Stretched Ceilings Requirements and Test Methods) covers Stretch Ceilings

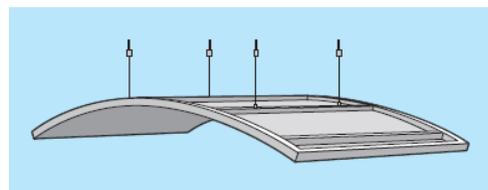


**Discontinuous ceiling** – a ceiling element that is hung or fixed to the soffit as single independent unit and is not connected to perimeter walls or partitions.

Depending on the element they can be installed vertically or horizontally.

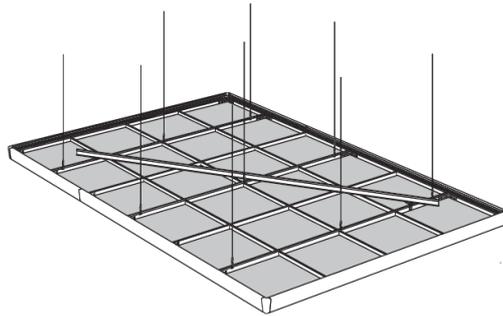
Normally referred to as Islands, canopies or rafts they come in a number of forms.

- **Single Elements**



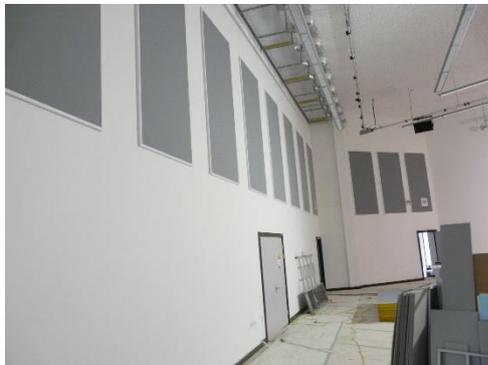
# Specifiers guide Ceilings and absorbers

## Kits



These are normally supplied as a kit and constructed on site. Often designed using many standard components they can be used to make large Islands within in a room or space.

## Acoustic absorbers



Individual absorbers fixed to the wall of a drama studio



Individual absorbers fixed in a semi continuous band to the wall of a teaching area

Formed from single or multiple elements, acoustic absorbers can be suspended from the soffit/ ceiling, fixed to walls/ partitions or be supplied as a standalone screen. To achieve the best acoustic performance, they should be installed as per the test report with an appropriate gap/void depth behind the product if required. See Installation depth.

Where suspended from an existing soffit, ensure that the correct top fixings are used and if suspended below an existing suspended ceiling ensure that the original ceiling and existing top fixing can carry both loads

## Installation Considerations

Although this guide is written to provide guidance on the specification of suspended ceilings and acoustic absorbers, specifiers should ensure that the systems selected can be safely and correctly installed and will achieve the required performance.

For further guidance please refer to:

- [FIS BEST PRACTICE GUIDE INSTALLATION OF SUSPENDED CEILINGS](#)
- BS EN 13964 – Appendix A – Guidance for Installation

# Specifiers guide Ceilings and absorbers

## Load capacity

For ceiling systems, the maximum recommended load for a suspension system is based on its capacity to support a uniformly distributed load (UDL). This is normally based on main suspension profiles being suspended at 1200mm centres with hangers at 1200 mm along their length.

The maximum (UDL) is expressed in kilos per square metre and is normally based on the system achieving a Class 1 level of deflection as shown in BS EN 13964.

*NOTE: The stated UDL does not normally include the weight of ceiling tiles/infill units can vary. For example if the declared suspension system UDL is 10 kg/m<sup>2</sup> and the weight of the ceiling tiles/infill units are 4.5 kg / m<sup>2</sup>, the additional UDL it can carry to maintain a Class 1 deflection is 5.5 kg / m<sup>2</sup>*

The UDL of a system can be increased by reducing the installation centres of the main profiles; increasing the frequency of the hangers; independently supporting the additional elements. Many manufacturers also offer their suspension profiles in a range of different heights that can be used to provide a larger span between hangers or increase the systems load capacity.

Although additional elements placed in or on the ceiling system may not cause it to exceed the system UDL, it is important to establish whether the tiles / planks/infill units are able to support the load in their own right or if there is a need to provide additional support in the form of a pattresses and / or independent suspension.

Where the ceiling infill panel is manufactured from a hygroscopic material and used in high humidity environments such as shower areas and hydrotherapy pools some products may dramatically increase in weight. This eventuality should be allowed for in load calculations for both the ceiling system and method of top fix.

The manufacturer should be consulted to ensure that the anticipated design load can be accommodated.

## Top Fixings

The selection and installation of the correct top fixing method is critical and should be noted on the relevant drawings (BS EN 13964 A.5.7). With so many different types of soffit this is a specialist area and The FIS, working in conjunction with Construction Fixings Association, produced the following publication based on three ceilings loads.

Light weight	A ceiling with a maximum dead load of less than 10 kg /m <sup>2</sup>
Medium Weight	A ceiling with a dead load between 10 kg / m <sup>2</sup> and 30 kg / m <sup>2</sup>
Heavy weight	A ceiling with a dead load in excess of 30 kg/m <sup>2</sup> (e.g. multilayer plasterboard)

*NOTE Incorrect specification or incorrect installation of top fixings (anchors) are one of the most common reasons for ceiling collapses,*

*NOTE: Fluctuations in air pressure caused by wind or large opening doors may increase the load on the fixings*

The FIS BEST PRACTICE GUIDE - SELECTION AND INSTALLATION OF TOP FIXINGS FOR SUSPENDED CEILINGS provides specific guidance [HERE](#)

*NOTE: BS EN 13964 A.5.7 states: "the chosen (selected) top fixing method shall be detailed on the relevant drawings.*

# Specifiers guide Ceilings and absorbers

In addition, as a specialist association The Construction Fixings Association has put together a number of “How to Guides” to help you understand the selection, installation and testing of fixings based on [BS8539](#) –the Code of practice for the selection and installation of post-installed anchors in concrete and masonry. Proof testing is not complicated and is important, it is the only safe way to find out if the selection and installation is correct for the project.

These, along with other important information, can be found at:

[The Construction Fixings Association](#) provides information about drilled in fixings and anchors for concrete, masonry and plasterboard

<https://www.the-cfa.co.uk/>

[CIRIA](#) (Construction Industry Research and Information Association) have produced guidance on construction fixings in their publication **General fixings – selection and whole-life management (C777)**. In it they have created a fixings rating system based on the consequences of failure called **RAG**.

This stands for:-

RED – Critical Fixing

AMBER – Less Critical

GREEN – Important but not critical

<https://www.ciria.org/>

[SER Scotland](#) - Structural Engineers Registration Ltd has been appointed by the Scottish Government's Building Standards Division to administer a scheme for Certification of Design (Building Structures).

[SER Jersey](#) has been appointed by The States of Jersey Planning and Environmental Department to administer a scheme for Certification of Design (Building Structures).

B61.1 Internal partitions and ceilings

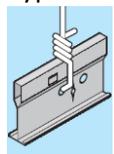
<https://www.ser-ltd.com/>

## Hangers

There are a number of generic as well as special hanger types available and selection will be dependent on

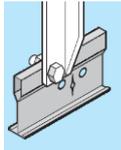
- Ceiling system / acoustic absorber requirements e.g. a metal concealed system would require a rigid metal hanger
- Other forces acting on the ceiling e.g. lateral movement, deflection, project environment etc.

Types of common hangers



2 mm Ø galvanised steel wire. Normally supplied in coils of around 200 linear metres and cut to length on site. The wire must be pre-tensioned prior to use and be tied off with a minimum 3 turns on top and bottom connections.

# Specifiers guide Ceilings and absorbers



19 x 19 mm or 25 x 25mm galvanised steel or aluminium angle –supplied in 3000 mm lengths and various thickness and gauges (minimum 0.8mm) depending on the requirement and cut to size on site. Mechanically fixed to hanger and ceiling profiles.



4 mm Ø diameter adjustable steel rods. Supplied with top and bottom rods along with a connecting “butterfly”. The butterfly provides the fine adjustment and connection of the two rods. The top and bottom rods are normally available with the choice of a hook or eye on one end and supplied in a number of fixed lengths. Some manufacturers also offer the option of a snap or slide on connection on the bottom rod.



Nonius hangers are formed from a lower channel that has a bottom pressing formed to slide over or into the ceiling profile and an upper channel which is mechanically fixed into the soffit. They channels are designed to nestle together and are fixed and adjusted using securing pin/s pushed through holes in the legs of the channels



- Threaded Rod Used for suspending ‘heavy weight’ ceilings



Wire hanging kit for rafts, islands etc.



Resilient or acoustic hangers are designed to reduce the transmission of sound and vibrations into and from the building structure or services.



Soffit cleats, are a fixing point for the hangers and are used in conjunction with a suitable top fixing

Ensure that the top fixing and hanger type are compatible and that they can provide the correct carrying capacity.

The manufacturers should advise the correct type of hanger for their system.

## Installation depth

When selecting a ceiling consider the void depth requirements to meet the system acoustic performance and system being used, especially where services run through the void and access into the void is required. Service elements can also adversely affect hanger spacing.

# Specifiers guide Ceilings and absorbers

Where access into the void is required, the general consensus suggests that an exposed grid system should be installed with a minimum depth of 120 – 150 mm. This will be dependent on the size and thickness of the ceiling infill panel and assumes no restrictions in the void such as joists beams or services that may hinder access.

Where the ceiling or acoustic absorber is providing fire, acoustic or other proven levels of performance the installation depth should as per the relevant test certificate/report. Ignoring the test installation depth without consulting the manufacturer or a consultant may cause a significant reduction in acoustic performance and /or a significant reduction in the required level of fire resistance, thereby posing a serious risk to life and property.

*NOTE: Void depth is critical as the space between the back of the product and the soffit /wall will impact performance.*

*NOTE: The void depth can be found in the test report provided by the manufacturers.*

## Intersection of walls / partitions / ceilings

### Wall / partition trims

A ceiling trim is applied to the walls to take up variations in room dimensions and to form a neat and secure intersection with the wall/partition.

The shape, size and composition will be reliant on the ceiling system and design requirements. Ceiling trims are manufactured primarily in aluminium and pre painted steel

Standard steel trims.

“L” shaped trims produced from 0.5 mm pre-painted steel



All trims should be installed in accordance with the manufacturer’s instructions and /or In the case of performance ceiling, in accordance with the method shown in the test report.

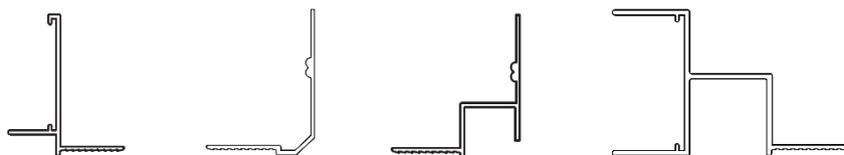
### Aluminium Transition and standard wall trims

Aluminium trims provide a comprehensive selection of standard and specialised profiles. Transition trims are primarily designed for use at the interface of upstands and different types of ceiling systems.

The most common example of this is where a [perimeter margin](#) or narrow band of an independently suspended ceiling, such as gypsum MF, has been included in the room design to address variations in a room size and shape allowing the use of full tiles in the main field area.

The use of a suitable transition trim at the interface of the two ceilings provide a neat the need to cut tiles and reduces waste.

## Specifiers guide Ceilings and absorbers



It is imperative that these margins are properly co-ordinated with the main suspended ceilings and that all elements are independently suspended and installed in accordance with the manufacturer's instructions.

### Partitions

If partitions are installed full height i.e. from floor to structural soffit, pre-painted steel or aluminium perimeter trims should be used, ensuring that manufacturer's installation recommendations are followed

It can be acceptable to install non loadbearing mid-weight partitioning to the underside of a suspended ceiling, provided that the fixing is directly into the ceiling grid main tee / framework, and the performance of the partition is maintained in the ceiling void by installing fire and acoustic barriers where necessary, and the installation is strictly in accordance with the manufacturer's instructions and test certification

The partitioning stability is gained from the partition layout and should not add any loading to the ceiling. The ceiling grid main tee / framework which the top track of the partition is fixed should be considered to provide location only. (See 6.1 FIS BPG Installation of Partitioning) [ADD LINK](#)

Where operable walls are being installed, there will be a need to construct suitable framing behind the suspended ceiling to carry the necessary weight and load requirements of the wall.

### Integration of Services.

It is important for information regarding the types, loadings and dimensions of service elements are discussed with the specialist ceiling contractor / ceiling manufacturer to ensure a smooth and cost-effective installation of both disciplines.

The colour of the service elements such as grilles, speaker etc., element should be checked against the colour of the grid and tiles.

*NOTE: all cables should be independently supported and not left to lie on the back of the ceiling*

### Project planning

Sufficient time should be allocated for the procurement delivery and installation of the suspended ceiling.

Meetings should be held as early as practical with the specialist contractors to ensure all aspects of the specification are understood and the programming is achievable.

# Specifiers guide Ceilings and absorbers

## Site conditions / Project environment.

Suspended ceilings and acoustic absorbers are essentially a finishing trade and therefore the building should be in a suitable condition before systems are installed.

The manufacturer's recommended site conditions for the installation of its materials should be followed.

Suspended ceiling work is normally carried out in one operation. The prior fixing of hangers or main grids as a separate operation from the fixing of the panels will add to the cost of the installation. Where mobile platforms are used, areas required for installation should be clean and clear of equipment and materials of other trades to provide an adequate and safe working space. The specialist contractor should leave these areas in a clean state after installation of the ceiling.

See the FIS Site guide for suspended ceilings for more information about project planning and site requirements [HERE](#)

## Material handling

Meetings should be held with the main contractor and specialist contractors as early as practical to ensure that consideration is made for the safe ingress of materials and storage of materials on site in accordance with the manufacture's recommendations.

See the Health in construction leadership group (HCLG) report [HERE](#)

## Manufacturer's recommendations

Manufacturer's installation recommendations should always be followed. This is especially important where the ceiling is expected to satisfy performance criteria.

*NOTE: Although different components from different suppliers may look similar it does not mean that they can provide a similar performance.*

Manufacturers spend a lot of time, money and design effort to ensure their product / system attain required levels of performance. If specifications are changed or recommended installation methods are ignored the design and performance levels become the responsibility of the person or organization that changed them.

You should always speak to the manufacturer if you need to change any aspect of the installation or design.

## Manufacturer installer schemes

Many systems owners can provide a list of contractors who are trained on installing their systems. Where possible and where warranties are required these contractors should be approached to provide a cost to supply and install the system.

FIS is the trade body representing the sector, its members are vetted before joining and then every three years. Members agree to comply with the code of conduct and install products in accordance with the FIS good practice guides.

A list of vetted members who supply and install suspended ceilings and absorbers can be found [HERE](https://www.thefis.org/member-directory/)

# Specifiers guide Ceilings and absorbers

## People

### Competency framework

A Competency framework based on Skills Attitude, Knowledge and experience 'SAKE' was referenced in the [CIC raising the bar report](#) WG12 has identified that there are four factors that come together to describe competence; SAKE

- ❖ Skills,
- ❖ Attitude,
- ❖ Knowledge and
- ❖ Experience

These factors - defined, attained, acknowledged and verified - create a formal framework for product competence.

**Inspection** of suspended ceilings should be carried from the floor in natural lighting conditions.

### Maintenance

Access into the void. Where access is required to the void between the ceiling and soffit, for example to maintain the M&E, then removal of the tiles should be carried out by a suitably qualified and competent person, this is particularly important where concealed and semi concealed ceilings are installed.

See also - [FIS BEST PRACTICE GUIDE - MAINTENANCE AND ACCESS INTO SUSPENDED CEILINGS](#)

## Common risks and how to avoid them

### TOP 10 REASONS why ceilings fail

1. Incorrect selection of fixing
2. Incorrect installation of fixing
3. Additional load applied
4. Insufficient number of fixings
5. People working in the ceiling void inappropriately
6. Failure to follow manufacturer's guidance/instructions
7. Modification by other trades
8. Insufficient supervision/training
9. Structural vibration causing fixings to fail
10. Substitution of specified components

# Specifiers guide Ceilings and absorbers

## Appendix

### Regulations and Guidance documents

#### Education

[Building Bulletin 93](#): Acoustic Design of schools – performance standards

Building Bulletin 100: Design for fire safety in schools (under review)

#### Healthcare

Health Building Note: HTN 00-10 Part B: Walls and ceilings

Health Technical Memorandum: HTM 08-01: Acoustics

Health Technical Memorandum: HTM 05-02: Firecode

Health Technical Memorandum: SHTM 60 (Scotland) Ceilings

### [FIS Finishes & Interiors Sector – Best Practice Guides](#)

Installation of Suspended Ceilings

Installation of Dry Lining

Installation of Partitioning

Selection and Installation of Top Fixings for Suspended Ceilings

Maintenance and Access into Suspended Ceilings.

A Guide to Office Acoustics

#### Fixings

[Ciria Construction Industry Research and Information Association](#)

General fixings – Selection and whole life management (C777)

[TAIM– Association of Industrial Metal Ceiling Manufacturers](#)

Members of the TAIM undertake to comply with the TMMC "Technical Manual for Metal Ceiling Systems"

# Specifiers guide Ceilings and absorbers

## [England - Building Regulations](#)

### Approved Documents

- B -** Fire Safety: Volume 2: Buildings other than dwellings
- E –** Resistance to the passage of sound
- L2A –** Conservation of fuel and power in new buildings other than dwellings
- L2B -** Conservation of fuel and power in existing buildings other than dwellings

## [Scotland - Building Regulations](#)

Building standards technical handbook 2019: non-domestic

## [Northern Ireland - Building Regulations](#)

### Technical Booklets

- E-** Fire safety
- G-** Resistance to the passage of sound
- F2** Conservation of Fuel and power in buildings other than dwellings

## [Wales – Building Regulations](#)

### Approved Documents

- B -** Fire Safety: Volume 2: Buildings other than dwellings
- E –** Resistance to the passage of sound
- L2A –** Conservation of fuel and power in new buildings other than dwellings
- L2B -** Conservation of fuel and power in existing buildings other than dwellings

# Specifiers guide Ceilings and absorbers

## Standards

<b>Standard</b>	<b>Description</b>
<b>BS EN 13964</b>	Suspended ceilings — Requirements and test methods
<b>BS EN 14716</b>	Stretched ceilings. Requirements and test methods
<b>BS EN ISO 9001</b>	Quality management systems. Requirements
<b>BS EN ISO 14001</b>	Environmental management systems. Requirements with guidance for use
<b>BS ISO 45001</b>	Occupational health and safety management systems. Requirements with guidance for use
<b>FIRE</b>	
<b>BS 9999</b>	Fire safety in the design, management and use of buildings. Code of practice
<b>FIRE TESTS ON BUILDING MATERIALS AND STRUCTURES</b>	
<b>BS 476-4</b>	Non-combustibility test for materials
<b>BS 476-6</b>	Method of test for fire propagation for products
<b>BS 476 - 7</b>	Method of test to determine the classification of the surface spread of flame of products
<b>BS 476-11</b>	Method for assessing the heat emission from building materials
<b>BS 476-20</b>	Method for determination of the fire resistance of elements of construction (general principles)
<b>BS 476-21</b>	Methods for determination of the fire resistance of loadbearing elements of construction
<b>BS 476-22</b>	Method for determination of the fire resistance of non-loadbearing elements of construction
<b>BS 476-23</b>	Methods for determination of the contribution of components to the fire resistance of a structure
<b>BS EN 1182</b>	Reaction to fire tests for products. Non-combustibility test
<b>BS EN 1716</b>	Reaction to fire tests for products. Determination of the gross heat of combustion (calorific value)
<b>BS EN 11925-2</b>	Reaction to fire tests. Ignitability of products subjected to direct impingement of flame. Single-flame source test

## Specifiers guide Ceilings and absorbers

<b>BS EN 13823</b>	Reaction to fire tests for building products. Building products excluding floorings exposed to the thermal attack by a single burning item
<b>BS EN 13501-1</b>	Fire classification of construction products and building elements. Classification using data from reaction to fire tests
<b>BS EN 1365-1</b>	Fire resistance tests for loadbearing elements. Walls
<b>BS EN 1365-2</b>	Fire resistance tests for loadbearing elements. Floors and roof
<b>BS EN 1364-2</b>	Fire resistance tests for non-loadbearing elements. Ceilings
<b>BS EN 13501-2</b>	Fire classification of construction products and building elements. Classification using data from fire resistance tests, excluding ventilation services
<b>Acoustics</b>	
<b>BS EN 12354-6</b>	Estimation of acoustic performance of buildings from the performance of elements. Sound absorption in enclosed spaces
<b>BS EN ISO 717-1</b>	Rating of sound insulation in buildings and of building elements
<b>BS EN ISO 354</b>	Measurement of sound absorption in a reverberation room.
<b>BS EN ISO 11654</b>	Sound absorbers for use in buildings. Rating of sound absorption
<b>BS EN ISO 10140-3</b>	Measurement of sound insulation in buildings and of building elements. Laboratory measurement of airborne sound insulation of building elements
<b>BS EN ISO 10848-2</b>	Laboratory and field measurement of flanking transmission for airborne, impact and building service equipment sound between adjoining rooms. Application to Type B elements when the junction has a small influence
<b>BS EN ISO 140-18</b>	Measurement of sound insulation in buildings and of building elements. Laboratory measurement of sound generated by rainfall on building elements
<b>Colour/Gloss/Light Reflectance</b>	
ISO 12944-3	Paints and varnishes. Corrosion protection of steel structures by protective paint systems. Design considerations
BS EN ISO 2813	Paints and varnishes. Determination of gloss value at 20 degrees, 60 degrees and 85 degrees
<b>BS 8493</b>	Light reflectance value (LRV) of a surface. Method of test
<b>Thermal</b>	
<b>BS EN ISO 10456</b>	Building materials and products. Hygrothermal properties. Tabulated design values and procedures for determining declared and design thermal values

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<b>BS EN ISO 10211</b>	Thermal bridges in building construction. Heat flows and surface temperatures. Detailed calculations
<b>BS EN ISO 6946</b>	Thermal bridges in building construction. Heat flows and surface temperatures. Detailed calculations
<b>BS EN 13162</b>	Thermal insulation products for buildings. Factory made mineral wool (MW) products. Specification
<b>BS EN 13171</b>	Thermal insulation products for buildings. Factory made wood fibre (WF) products. Specification
<b>BS EN 12664</b>	Thermal performance of building materials and products. Determination of thermal resistance by means of guarded hot plate and heat flow meter methods. Dry and moist products of medium and low thermal resistance
<b>BS EN 12667</b>	Thermal performance of building materials and products. Determination of thermal resistance by means of guarded hot plate and heat flow meter methods. Products of high and medium thermal resistance
<b>BS EN 12939</b>	Thermal performance of building materials and products. Determination of thermal resistance by means of guarded hot plate and heat flow meter methods. Thick products of high and medium thermal resistance
<b>BS EN 10456</b>	Building materials and products. Hygrothermal properties. Tabulated design values and procedures for determining declared and design thermal values
<b>UPVC</b>	
<b>BS EN 13245-1</b>	Plastics. Unplasticized poly(vinyl chloride) (PVC-U) profiles for building applications. Designation of PVC-U profiles
<b>BS EN 13245-2</b>	Plastics. Unplasticized poly(vinyl chloride) (PVC-U) profiles for building applications. PVC-U profiles and PVC-UE profiles for internal and external wall and ceiling finishes
<b>Metal</b>	
<b>BS EN 573-3</b>	Aluminium and aluminium alloys. Chemical composition and form of wrought products. Chemical composition and form of products
<b>BS EN 1396</b>	Aluminium and aluminium alloys. Coil coated sheet and strip for general applications. Specifications
<b>BS EN 10143</b>	Continuously hot-dip coated steel sheet and strip. Tolerances on dimensions and shape
<b>BS EN 10152</b>	Electrolytically zinc coated cold rolled steel flat products for cold forming. Technical delivery conditions
<b>BS EN 10169</b>	Continuously organic coated (coil coated) steel flat products. Technical delivery conditions
<b>BS EN 10346</b>	Continuously hot-dip coated steel flat products for cold forming. Technical delivery conditions
<b>BS EN 10211</b>	Chemical analysis of ferrous materials. Determination of titanium in steels and cast irons. Flame atomic absorption spectrometric method
<b>Timber/Particle/Fibre boards</b>	
<b>BS EN 622-1</b>	Fibreboards. Specifications. General requirement

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<b>BS EN 312</b>	Particleboards. Specifications
<b>BS EN 335</b>	Durability of wood and wood-based products. Use classes: definitions, application to solid wood and wood-based products
<b>BS EN 350</b>	Durability of wood and wood-based products. Testing and classification of the durability to biological agents of wood and wood-based materials
<b>BS EN 351-1</b>	Durability of wood and wood-based products. Preservative-treated solid wood. Classification of preservative penetration and retention
<b>BS EN 351-2</b>	Durability of wood and wood-based products. Preservative-treated solid wood. Guidance on sampling for the analysis of preservative-treated wood
<b>BS EN 460</b>	Durability of wood and wood-based products. Natural durability of solid wood. Guide to the durability requirements for wood to be used in hazard classes
<b>BS EN 1912</b>	Structural Timber. Strength classes. Assignment of visual grades and species
<b>BS EN 599-1</b>	Durability of wood and wood-based products. Efficacy of preventive wood preservatives as determined by biological tests. Specification according to use class
<b>BS EN 599-2</b>	Durability of wood and wood-based products. Efficacy of preventive wood preservatives as determined by biological tests. Labelling
<b>BS EN 1912</b>	Structural Timber. Strength classes. Assignment of visual grades and species
<b>BS EN 1991-1-6</b>	Eurocode 1. Actions on structures. General actions. Actions during execution
<b>BS EN 1995-1-2</b>	Eurocode 5. Design of timber structures. General. Structural fire design
<b>Environmental</b>	
<b>BS EN ISO14025</b>	Environmental labels and declarations. Type III environmental declarations. Principles and procedures
<b>BS EN 15804</b>	Sustainability of construction works. Environmental product declarations. Core rules for the product category of construction products
<b>BS EN 12460-5</b>	Wood based panels. Determination of formaldehyde content. Extraction method called the perforator method
<b>BS EN 717</b>	Wood-based panels. Determination of formaldehyde release. Formaldehyde emission by the chamber method
<b>BS EN 16000-9</b>	Indoor air. Determination of the emission of volatile organic compounds from building products and furnishing. Emission test chamber method
<b>Others</b>	
<b>BS 8000-0</b>	Workmanship on construction sites. Introduction and general principles
<b>NA to BS EN 1998-1</b>	UK National Annex to Eurocode 8. Design of structures for earthquake resistance. General rules, seismic actions and rules for buildings

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<b>BS EN ISO 14644-1</b>	Cleanrooms and associated controlled environments. Classification of air cleanliness by particle concentration
<b>BS 8539</b>	Code of practice for the selection and installation of post-installed anchors in concrete and masonry

## Glossary of terms

INVITE suggestions based on if the word is not self-explanatory

*To be compiled.....*

BREEAM	BRE Environmental Assessment Method
SKA	Environmental assessment for non-domestic fit outs
LEED	Leadership in Energy and Environmental Design
Green Star	Australian environment rating system
Etidama	Abu Dhabi environmental, economic, cultural and social rating system
WELL	Best practice in design based on medical and scientific research
Cradle to Cradle	Environmental product assessment
Blue Angel	Environmental product assessment
EPD	Environmental Product Declaration
DoP	Declaration of Performance
RT	Reverberation time (Sound)
REI	Measure of Fire resistance.....
EI	Measure of Fire resistance
HTM	Health Technical Memorandum.....
HBN	Health Building Note.....

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Manufacturers are encouraged to publish their performance data using the table below

Manufacturer				Product Name		Reference	
	Parameter Name	Value	Standard	Specification Requirement		Test report number	Assessment report number and expiry date
				Regulation	Other		
1	Acoustics	$\alpha_w$ 0-1.00	<b>Absorption</b> BS EN ISO 354 <b>(Under review)</b>	Approved Document E Common Parts	LEED , SKA Rating, BREEAM, Well Building standard Health HTM 0801		(include air gap behind panels during test)
		Absorption classes A-E	BS EN ISO 11654	Education BB93			
		$D_{nfw}$ Double pass	<b>Attenuation</b> (Sound Insulation) BS EN 140-3	Education BB93 Health HTM 0801	LEED , SKA Rating, BREEAM, Well Building standard		
		$R_w$ Single pass	BS EN ISO 10140,  BS EN ISO 717-1 , BS EN ISO 10848-2				
2	Fire		Reaction to Fire EN13501-1	Approved Document B CPR CE marking	BS 9999 BS 9991		
		In Minutes <b>R</b> Resistance/load bearing capacity <b>E</b> Integrity <b>I</b> insulation	Resistance to fire BS476-20-21-22-23 BS EN 13501 EN1365-2, EN13381 EN 1364-2	Approved Document B  CPR CE marking	BS 9999 BS 9991		
3	VOC	E1 Rating	BS EN 717	CPR CE marking	LEED , SKA Rating, BREEAM, Well		

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					Building standard		
4	<b>Sustainability</b>		Environmental Product Declaration (EPD) ISO 14025, BS EN 15804	BREEAM SKA Rating LEED WELL			
5	<b>Recycled content</b>		Environmental Product Declaration (EPD) ISO 14025, BS EN 15804	BREEAM SKA Rating LEED WELL			
6	<b>Light reflectance Value LRV</b>	%	ISO 7724-2-3  BS 8493		LEED , SKA Rating, BREEAM, Well Building standard		
7	<b>Humidity</b>	% RH Class A, B, C, D.	BS EN 13964				
8	<b>Hygiene</b>	Class 1-12	ISO 14644:1		Health HTM 0801		
9	<b>Clean room</b>	Class 1-12	ISO 14644:1	Euro codes			
10	<b>Corrosion</b>	A, B, , C, D.	BS EN 13964  BS EN ISO 12944-2(1) NOTE needs more clarification.		SCI		
11	<b>Thermal conductivity</b>	(W/Mk)	BS EN 12664 BS EN 12667 BS EN 12939	Building Approved document L			
12	<b>Impact resistance</b>	Class 1a 2a 3a	BS EN 13964	CPR CE marking	Education leisure and sports		
13	<b>Wind loading</b>		<i>Individual engineered solution</i>				
14	<b>Tolerances</b>		BS EN 13964	CPR CE marking			

○ Table X Standard method of publishing performance data for suspended ceiling and absorbers