



## ROOM ACOUSTICS

Room acoustic design is important for any occupied internal space, from single occupancy offices to large dedicated auditoria.

A poor room acoustics environment can adversely affect the productivity, health and comfort of users as well as inhibiting the function of the space.

**Parameters which are typically used to describe room acoustics include:**

### Reverberation time

The time taken for a sound to decay by 60dB. The higher the reverberation time the more 'reverberant' or 'live' the space sounds.

### Speech intelligibility

A measure of how easily speech can be understood for given locations. Speech Transmission Index values range from 0 to 1.0, the higher the number the better the intelligibility. The main factors affecting speech intelligibility relate to background noise and reverberation time.

### Absorption

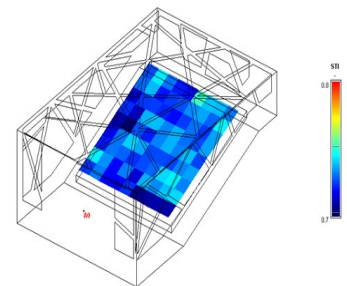
The level of sound absorption within the space. Generally the more absorption there is the lower the reverberation time should be, although absorption location can also play an important role.

### Reflection effects

The way in which reflected sound is perceived by a listener, relative to the direct sound from a source, can result in undesirable and distracting 'echo' effects (such as 'flutter' and 'focusing').

### Room modes

Within small rooms designed for audio, standing wave interference can occur between surfaces without acoustic treatment, creating unwanted 'resonances' or 'flat-spots' at certain audible frequencies. The assessment of room modes can be used to describe these potential interferences.



## Geometrical ray tracing acoustic modelling

An important aspect of the way Hann Tucker Associates (HTA) approach the assessment of room acoustics is the implementation of a modern three-dimensional acoustic modelling technique, using Ray Tracing.

The model takes the absorption and scattering properties of surface finish materials into account, as well as the specific location of finishes. This means the effect on various Room Acoustics parameters of changing the location and/or performance of room finishes can be accurately predicted. Audio files demonstrating how a space could sound once completed can also be produced, using auralisation software within the model.

We would always recommend the use of this type of modelling for medium to large complex spaces and auditoria. There are more basic calculation methods commonly used but these only deal with reverberation time, may not give accurate results for some types of room and do not enable the 'fine-tuning' of finish locations.

The images used in this CIB represent a selection of acoustic models produced by HTA.

### When is it necessary for room acoustics to be assessed?

There are room acoustic design parameters requiring design input and specifications from a suitably qualified acoustic consultancy within most building projects. Room acoustics criteria requiring specialist design input include:

#### Residential dwellings

Building Regulations Approved Document E:2003 Requirement E3 stipulates absorption requirements for some common areas, requiring an assessment of the proposed finishes.

#### Office developments

BREEAM, BCO 2014, BS8233 2014 and The Association of Interi-

or Specialists (AIS) Design Guide all contain guidance related to suitable reverberation times and levels of absorption, requiring an assessment of the proposed finishes. Geometrical acoustic modelling of auditoria is also advisable.

#### Healthcare

BREEAM and Health Technical Memorandum 08-01:2013 contain guidance related to suitable reverberation times, levels of absorption and STI (Speech Transmission Index) requiring an assessment of the proposed finishes and geometrical acoustic modelling to some areas.

#### Education

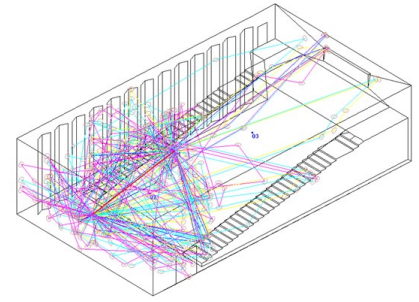
BREEAM, BB93 2014, Standards For School Premises 2013 and Independent Schools Standards Regulations 2012 contain detailed requirements for absorption, reverberation time and STI (Speech Transmission Index) for various rooms, halls, music rooms and other specific room types. This requires an assessment of the proposed finishes and geometrical acoustic modelling to some areas.

#### Law courts, industrial, retail, prisons and other building types

BREEAM contains requirements related to suitable reverberation times and levels of absorption, requiring an assessment of the proposed finishes.

#### Performing arts

Where theatres and auditoria are proposed careful acoustic design is imperative to a successful project, requiring a detailed acoustic model.



### What room acoustics services can Hann Tucker Associates provide?

HTA have extensive experience in assessment of Room Acoustic parameters for compliance with corresponding standards and regulations.

Our expertise in this area together with use of the latest geometrical acoustic modelling techniques mean that we are able to give accurate and detailed design advice and specifications.

Following project completion, HTA are also able to provide room acoustic commissioning services to demonstrate compliance.

**Hann Tucker Associates** were founded in 1971 and are the leading independent UK acoustic consultancy. By using our specialist knowledge and access to the latest room acoustic modelling software, we are able to provide accurate and feasible room acoustic design assistance.



## Hann Tucker Associates

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