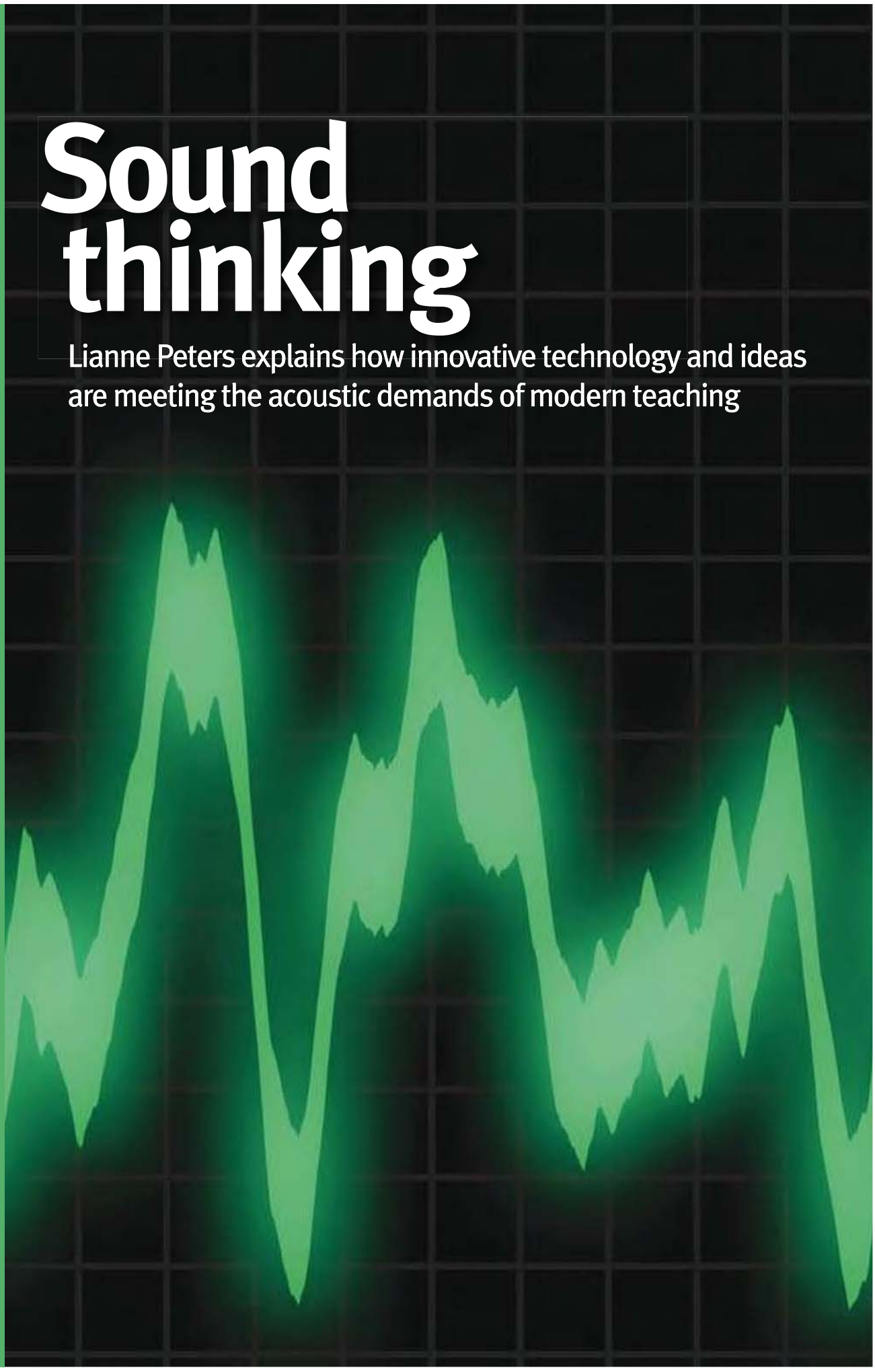
Sound thinking

Lianne Peters explains how innovative technology and ideas are meeting the acoustic demands of modern teaching



Acoustic baffles suspended at Archway School, below

The science of acoustics and its application within buildings can often be a confusing experience, with a seemingly endless array of different criteria and rating methods. A number of solutions are available to ensure that the appropriate acoustic performance is met. Suspended ceilings, wall panels, acoustic baffles, partitioning and doors can be designed for a diverse range of building types with equally diverse acoustic requirements including school classrooms, radio station studios, swimming pools and large open plan offices.

There are two acoustic properties relevant to suspended ceilings – sound absorption and sound attenuation. Sound absorption refers to the measure of the ability of a surface to absorb sound, minimising the reflection of sound energy back into a space. This is important as a predominance of acoustically reflective surfaces in enclosed spaces, such as a classroom, that can lead to an overly reverberant environment; the sound of a single voice can be less intelligible due to the many reflections of sound from the room surfaces. These reflections occur with a time delay compared to the sound energy that reaches a listeners ear directly and cause the sound to become less clear.

The room characteristic that defines this feature is 'reverberation time' – the length of time (in seconds) that it takes for a sound source to decay by 60dB. Different environments have differing demands, depending upon the use of the space, and there are differing subjective terms used to describe the different characteristics. Two extreme examples are a radio broadcast studio, where a reverberation time of around 0.2 seconds is required, the sound is described as 'dry' or 'dead', or a swimming pool, with a reverberation time that could be as long as 3.0 seconds, with a 'bright', 'live' or 'reverberant' sound.

Sound attenuation is used to describe the reduction in sound between two spaces separated by a dividing element, with two basic sound transmission paths that will affect the eventual perceived sound level difference. Direct sound transmission is the level of sound passing through the dividing element, and flanking sound transmission is the level of sound passing through surrounding structures. Sound attenuation is measured in accordance with procedures set out in BS EN ISO 140, and defined in BS EN ISO 717. Performance is assessed in terms of third octave band values, with weighted single figure ratings provided to allow ease of comparison.

The education sector in the UK responded to the need to improve acoustics in schools in 2003 with the Department for Education and Skills' Building Bulletin 93: Acoustic Design of Schools (BB93). All regulations within BB93 are mandatory and specify the acoustic design criteria requirements for all primary and secondary education facilities as well as containing performance standards for many areas within a school, including classrooms.

The research that led to these regulations found that the development of language skills was often

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negatively affected by the acoustical environment in which it takes place. Being able to hear clearly through communication with teachers and peers was vital for children to grasp grammar rules and phonetic structure through repetitive exposure to clear auditory. Studies have shown that exam results in state schools with good building conditions are on average 17% higher than similar schools elsewhere. It was also noted that good speech intelligibility helped limit teacher fatigue. It is recommended that a well-designed mix of sound absorbent and reflective surfaces is specified to achieve maximum acoustic comfort.

SAS International has a strong history of working with design teams in order to meet the acoustic requirements of both new build and refurbished schools. It is vital that specifications consider background noise levels (indoor ambient noise levels); airborne and impact sound insulation between spaces, reverberation times, sound absorption in circulation spaces; and a high speech intelligibility criteria for open plan spaces.

Although it is vital that all acoustic requirements are indeed met, SAS will also work with architects to ensure that bespoke solutions are available for specification so that good design does not have to be sacrificed for acoustic comfort. Aedas Architects’ design for award-winning Petchey Academy in North London called for a strong statement wall with a touch of colour that also provided a practical acoustic solution for its ‘state-of-the-art’ building.

Aedas created a striking design which features a large-open plan atrium area. In this area a robust wall panelling system for the internal space was required, with aesthetics also being an important consideration. Perforated panels were fitted with an acoustic material to assist in achieving the required BB93 reverberation time. The panelling was required to fit around a statement walled curved area within the building, situated in a main entrance and thoroughfare area, visible from outside.

As a result, the purpose designed academy offers students vibrant, modern surroundings and facilities for learning and development. The bottom section of panelling in this high traffic area needed to be especially robust and achieve specific impact resistance, backed with Fermercell board for this purpose. A seamless flow was also achieved with panels wrapping around doorways.

In addition, Archway School in Stroud demanded an excellent acoustic solution for an additional facilities project. Multi-disciplinary practice B3 Burgess specified acoustic attenuators for the scheme from SAS International to work within the two-storey block’s open plan, naturally ventilated space.

Acoustic levels were a key consideration for this new build scheme, which comprises technology and entrance blocks totalling 2,715 square metres for the provision of ICT suites, offices and

Corby Business Academy benefited from SAS International's acoustic solution, facing page (photo: Foster & Partners). Aedas Architects' state-of-the-art Petchey Academy in North London, below

a recording studio. For the project, a sound attenuation rating of RW3/RW5 was stipulated.

The SAS International metalwork solution involved the design and installation of different types of acoustic attenuators. The acoustic characteristics of open plan spaces do not follow normal rules for regular proportioned rooms therefore a totally different approach was required to meet acoustic demands.

The SAS International acoustic attenuation solution for Archway School represents a series of acoustic baffles suspended vertically to provide acoustic absorption. They can be manufactured for all applications from commercial offices to large open atria. In this project they were used in conjunction with metal bulkheads as a means of linking the appropriate building elements.

Eliminating sound reflection from walls is particularly important for productive educational environments and acoustic wall panels are now commonly being used in halls and open atrium spaces, as well as classroom environments.

Perforations and acoustic pads can be used to ensure good sound absorption and reduce reverberation – combinations of plain sound reflecting tiles and perforated sound absorbing panels can be used to create the preferred acoustic environment, as is the case in this installation.

Sound absorbent suspended ceilings are able to provide a multitude of acoustic solutions while also allowing for significant degree of design flexibility. SAS International's System 600 is an acoustic lighting raft or module that is suspended directly from a flat structural soffit or within coffers that allow for thermal mass cooling and free air movement to the structural slab. As with all SAS suspended ceilings, they are available with a range of acoustic treatments which can absorb sound through the perforations in the face panel as well as reflected sound from the structural soffit. These acoustic rafts are able to be tailored to ensure design continuity regardless of a building's design. Although rafts and modules are most often specified in a flat or curved design, SAS's bespoke service allows for angular, radial or waveform designs.

SAS International's System 600 acoustic lighting rafts were specified by leading architects' Foster + Partners for the innovative Corby Business Academy (CBA) in Northamptonshire. Acoustics were a major concern for the client and the design brief called for very specific solutions that would meet the strict acoustic performance criteria, while also adding to the open and bright feel the client wanted for the school. A bespoke design solution was provided that included the System 600 acoustic lighting rafts as well as acoustic wall panelling that was installed in the library and classrooms throughout the 11,600 square metre building. All SAS manufactured products had to reflect both the design needs of each classroom and the acoustic needs of the students.

When specifying building solutions that will provide the acoustic demands required, it is important that good and innovative design is not sacrificed just to meet to legislative requirements. SAS International's suspended ceilings, acoustic wall panels and acoustic baffles and doors can be specified with a bespoke design solution that also meets and exceeds all necessary regulations. ***CEM***

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