

IT: Acoustic design software

Keeping the racket down

Acoustic designers could be costing clients money by over-specifying acoustic solutions. Now, software has been developed that tracks how sound moves through a building and how to stop it. **by Andy Pearson**

ARE ACOUSTIC DESIGNERS COSTING developers too much money? Matthew Fisher, senior acoustic consultant at Manchester-based NES Acoustic and Environmental Consultants, certainly thinks so – and he has developed the software to prove it.

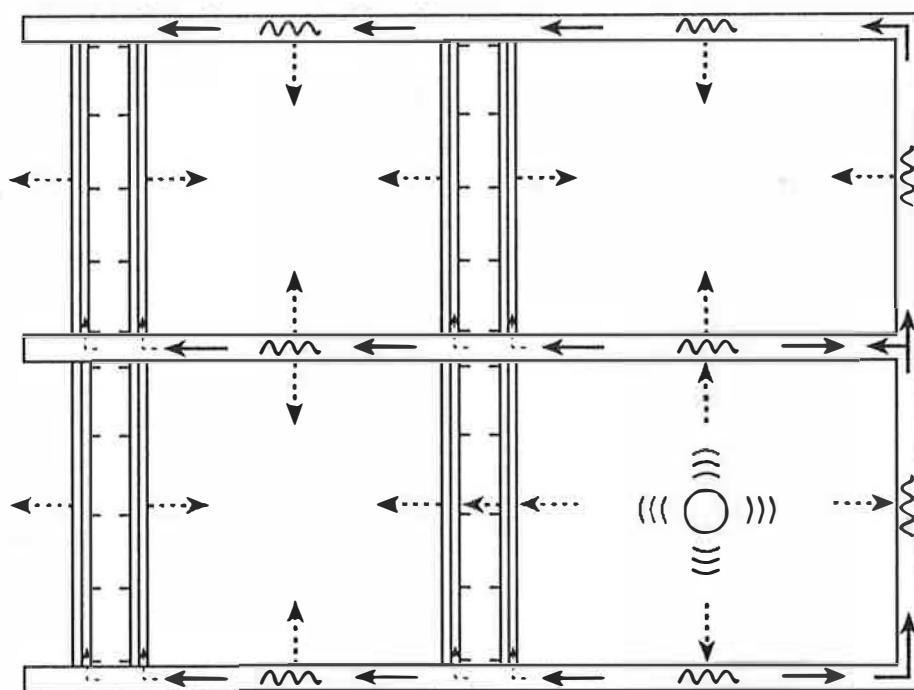
"Acoustic consultants over-specify acoustic solutions because they don't fully understand how noise travels through a building," he says.

The situation has been aggravated by the recent upsurge in mixed-use developments that rely on acoustic designers to cut out structure-borne noise, such as hotels with nightclubs and flats built over bars. The rise in the number of floating concrete floors in mixed-use developments is "at the behest of acoustic consultants", says Fisher. "Such constructions are costly but the cost of litigation in case of a failure is an even stronger persuader and leads to the inclusion of expensive safety margins in the acoustic design."




Fisher says that the lack of a sophisticated acoustic design method leads many designers to use rule-of-thumb calculation methods and out-of-date test data, so he set about designing a computer model that assesses the acoustic contribution of all the noise paths between rooms.

To treat structure-borne noise, you need to know how structural vibration is induced by the noise source, how efficiently that vibration travels in the structure and how much noise is then transmitted to other rooms. Fisher explains: "When we hear a noise from another room, the

How noise travels through a structure



Key

-  vibration in structure
-  direction of vibration
-  structure-borne noise

sound that reaches our ears doesn't just travel through the common wall but through each of the various structures forming the room." So, for example, the soundtrack of a film playing in a multiplex cinema's auditorium could reach the adjacent auditorium by moving up to the ceiling and through to the ceiling of the next room.

To assess how sound travels through a building, Fisher turned to a method used by NASA in the 1960s to predict the response of spacecraft to noise and vibration, called Statistical Energy Analysis. SEA identifies the different routes sound could take and assesses the acoustic significance of all the noise paths so that money can be spent where it is most needed and savings can be made where paths are shown to be less important.

At the heart of the method is Einstein's famous equation of the relationship between mass and energy in the universe: $E=mc^2$. Fisher explains: "A Range Rover travelling at 70 mph has more energy than a Mini travelling at the same speed because the Range Rover is heavier." When applied to acoustics, "the heavier a wall or floor, the less it will vibrate under the input of sound energy", says Fisher.

To model a building, the program needs information such as the room dimensions, the thickness and density of all building materials, the type of wall ties, cavity depths and whether sound-absorbent material has been used. From this data, the program can assess the acoustic contribution of all the possible structural noise paths and determine a room's overall noise level.

"As this is the first time SEA has been used in a program developed as a design tool to measure structure-borne sound in buildings, a considerable amount of validation was required," says Fisher. So NES used British Gypsum's acoustic tests for the Virgin cinema at Nene Park, Northampton, where British Gypsum plasterboard was used on the walls. The cinema was modelled on computer and the predicted acoustic performance calculated by the program was compared with the measured performance.

Fisher says the model showed that "construction costs could have been saved on

heavy linings to some of the walls without affecting the performance". More importantly, "The acoustic performance could have been improved by spending the money saved on the wall linings elsewhere."

"The problem with cinemas is that many designers will have a template for a multiplex development," adds Fisher. If the end-user has no complaint about the sound insulation, that template is likely to be used for the next development. As at Nene Park, "it may be the case that some constructions used in the development were not required to achieve the specified sound insulation and a less costly design solution may be appropriate".

The program is not confined to cinemas, however. NES has designed the acoustics for a proposed apartment block with a nightclub on the ground floor. Fisher claims the program has identified design changes that could save 10% of the project's cost.

For developers, this software could help demystify the black art of acoustic design. Using the model, acoustic designers can present a justification for the expensive constructions that are deemed necessary for developments.

NES is now considering how best to market the package. Although it has been approached by software development houses, for the moment it is keeping the secrets of the software to itself.

Noises off

PROS

- Accurately measures acoustic movement
- Can save clients money

CON

- Needs a lot of architectural and structural information

On the wire

Clay pipe web site

The Clay Pipe Development Association's web site has been expanded to include data on specification and installation. The site now offers access to the association's key technical documentation covering clay drainage system design and construction, and the specification of clay flue systems.
www.cpda.co.uk

Accredited fire door makers online

BM Trada Certification's new web site lists fire door manufacturers whose products conform to all technical and regulatory requirements. The site details the types of door the firms offer and their contact numbers.
www.bmtrada.com

PCVue firm on the Net

PVCue manufacturer Kestrel Building Products has introduced a web site that details the company's windowline, cladding and roofline ranges.
www.kbp.co.uk

Contractor in cyberspace

Building, civils, maintenance and rail contractor Osborne Group has launched a web site that offers information about the company, its activities and clients.
www.osborne.co.uk

Jobs on the web

Technical and managerial recruitment specialist Hill McGlynn's new site lists permanent and contract vacancies and allows candidates to e-mail their CVs.
www.hillmcglynn.com

Eaves web site

Dale Fabrications has launched a web site aimed at architects and contractors that details the company's range of aluminium products, including fascia soffits, gutters and downpipes, and brises-soleil.
www.dales-eaves.co.uk

Restoration services

Restoration specialist Original Features' new web site details the company's services, including its Victorian tiled floor renovation service.
www.originalfeatures.co.uk

Radiator freeware

Barlo has launched a web site on its radiator range. To ease specification, users can download a free copy of the company's heat loss calculation software.
www.barlo.co.uk/radiators

Northern Ireland builder goes online

Northern Ireland-based house and commercial builder Euro Construction Corporation has launched a web site that details the company's services.
www.euroconstruction.co.uk