

Acoustic Design for Workplaces

Why acoustics in workplaces matter

As workplaces move to greater density and less private space for both economic and organisational reasons, acoustic performance will become increasingly important. Here's an outline of the impact of poor acoustics at work.

The acoustic challenge

Over the last decade, the way we work has changed radically. Higher workstation densities, the rise of collaboration and the introduction of different technologies, from speaker phones to desktop video conferencing, have increased noise levels at work.

Studies shows that many work environments are doing a poor job of providing acoustical comfort, that is, appropriate acoustical support for interaction, confidentiality, and concentrative work.

In fact, according to the US Center for Workplace Strategy¹, acoustic problems are a leading source of employee dissatisfaction in offices.

¹ Sound Matters: How to achieve acoustic comfort in the contemporary office, GSA Public Buildings Service, December 2011

Productivity and satisfaction

Research conducted with six major US corporations² found that lack of speech privacy decreases employee satisfaction and productivity:

- + **70%** of employees say that noise in the open plan environment is the number one workplace distraction, affecting satisfaction and productivity
- + **52%** of employees reported that they felt stressed at work — due to lack of ability to think and concentrate in the open plan environment

Following acoustical corrections in each of the six workplaces, the following improvements were found:

- + **175%** increase in employee satisfaction in a quieter workspace
- + Worker satisfaction with all other types of noise in the open plan improved by an average of **25%**
- + Stress levels were reduced — workers reported an average 'improvement' of **27%**.
- + Perceived productivity increased — workers said their productivity improved after three months in the quieter workspace by an average of **13%**

² The Sound of the Effective Workplace, Dynasound Collaborative Studies

³ ATCO International Co. A Case Study of Office Speech Noise Distraction and Worker Productivity



In one specific case study, a national manufacturer and distributor of chemical supplies, ATCO, conducted a six-month study in their head office call centre³:

- + The telemarketing centre was an open plan environment
- + A survey was conducted prior to acoustical corrections to determine employees' opinions of their workspace environmental conditions
- + Open plan noise levels were rated to be the number one employee distraction in the workspace

Acoustics in workplaces: why does it matter?

The acoustical corrections included the following:

- + The original .55 NRC (Noise Reduction Coefficient) ceilings were replaced with high performance .95 NRC ceilings
- + Sound masking systems were installed
- + Original 1m high non-absorptive furniture panels were replaced with .70 NRC sound absorptive panels
- + Sound absorbing wall panels were installed in several perimeter areas to prevent sound reflection into adjoining cubicles, from hard wall surfaces
- + No other changes were made to the workspace in the call centre

After acoustical corrections were made:

- + Noise levels in the call centre area were reduced by an average of six decibels
- + Follow-up surveys showed a **300%** increase in worker satisfaction with the reduction of speech and conversational noises
- + Worker satisfaction with other building facility and telephone ringer noises also increased by a factor of **140%**
- + Although workers had estimated that their productivity and sales would increase by an average of **8%** in a quieter environment, the actual results were far more dramatic, with an increase in average sales per worker, of **19.8%**.



Not as simple as making things quieter

The value of quiet spaces for those engaged in tasks that require uninterrupted concentration is well-documented⁴:

- + Individuals working in quiet spaces achieved **16%** higher performance scores in memory tests, and almost **40%** higher in mental arithmetic tasks, as compared to open office environments with 65dB(A) background noise including speech (*Banbury and Berry*)
- + In a controlled laboratory experiment, irrelevant speech and music brought an **8%** increase in total error rate in serial recall tasks when compared to the error rate in quiet conditions (*Wolfgang and Hellbruc*)
- + Following a distraction, 15 minutes of immersion time is required to return to optimal levels of concentration (*Mawson*)
- + General conversational distraction causes 70 minutes of lost productivity in an eight hour office day (*Harvard Business Review*)

However, a balance between adequate quiet (to avoid discomfort and disturbance) and adequate masking

⁴ The impact of office design on business performance, CABE & British Council of Offices



sound (to protect confidentiality and create a 'buzz'), is needed.

In some instances, increasing noise levels produces better results:

- + Performance of simple tasks improved **38%** and **27%** for complex tasks when working in an environment with white noise, as compared to tasks in unmasked noise conditions (*Loewen and Suedfeld 1992*)

Acoustics in workplaces: why does it matter?

- + Performance scores on simple tasks under masked office noise conditions were **12%** higher than those under quiet conditions and **20%** higher than under unmasked conditions, due to arousal effect. (*Loewen and Suedfeld*)
- + However, performance scores on complex tasks were **5%** higher in quiet spaces than under masked noise conditions, and **14%** higher than under unmasked noise. (*Loewen and Suedfeld*)

While these studies indicate that design is capable of delivering audio privacy in the workplace, the need to install barriers and other surfaces may reduce apparent openness: the effect may be to improve concentration, while reducing communication.

Research shows that communication dissemination and creativity are more sensitive to physical distance than technical communication. In fact, according to academic Tom Allen⁵, the probability of interaction between individuals declines significantly after the first 50m of separation,

⁵ The impact of office design on business performance, CABA & British Council of Offices

⁶ Kraut, R et al (1990): 'Informal communication in organizations – Form, Function, and Technology' in Oskamp and Spacapan (eds) *People's Reaction to Technology: In Factories, Offices and Aerospace*. Sage, Newbury Park, CA.

and that this result is largely independent of the industry measured.

In addition, more than **80%** of the most valuable interactions can be classified as informal, including the type of short interactions that might occur while passing in a hallway or while stopped at a vending or coffee machine.⁶



Workplace designers face a difficult challenge: how to reduce distractions and enable speech privacy, without reducing the benefits of interaction. Here are the key acoustic considerations.

We demand much of our workplaces today: we want choice and comfort, privacy and a sense of community. We want spaces designed for connectivity, collaboration and concentration; spaces that can be reshaped on the fly to suit our changing needs.

Yet, designing open plan offices, where physical activity takes place alongside concentrated work, is a major acoustic challenge.

You can imagine the scene... Pete and Julie gather up their things and head for a meeting; Sue announces she needs a cup of coffee and a sugar hit; the creative team are excitedly unpacking some new materials; procurement and engineering are in heated discussion; Steve's very loud phone conversation is dragging on, Emma who has been dealing very diplomatically with a client's pain point now has a smile in her voice; someone's mobile device is broadcasting the Doctor Who ring-tone because no-one's answering, and all the while traffic rumbles by outside, the HVAC system

drones on and the copy machine spews out endless reams of paper... Meanwhile you're still at your workstation trying to concentrate.

To make sure that everyone can function in an office landscape, reverberation time and the general noise level need to be kept to a minimum. Noise suppression measures involving sound absorption and sound diffusion need to be put in place.



Articulation Index (AI) versus Privacy Index (PI)

The articulation index (AI) is a measure of the intelligibility of speech in a continuous noise environment like open plan offices and call centres, and is rated from 0.00 – 1.00 (0 – 100% intelligibility).

However, the foundation of acoustical comfort in the office is the Privacy Index and is the opposing value to AI. The lower the AI, the lower the speech intelligibility but the higher the speech privacy. Conversely the higher the AI, the higher the speech intelligibility, and the lower the speech privacy.

Imagine going into an office, closing the door and reading 100 words at random out of the dictionary. If your colleague in the adjoining office can understand five words out of 100, the office has achieved a PI of 95. This is the definition of confidentiality.

A Privacy Index of 80 defines normal privacy and is a level that allows for a significant reduction in distractions.



The 20% of words that can be understood does not provide sufficient content to break concentration and take workers off of their task.

The Privacy Index range from 0.00 – 1.00 is divided into four categories of privacy:

- + Confidential: 0.00 – 0.05
- + Normal: 0.05 – 0.20
- + Marginal: 0.20 – 0.30
- + None: 0.30 – 1.00

Articulation index is entirely dependent on the signal to noise ratio (S/N or SNR) which compares the loudness of the voice/signal to the loudness of the

background noise. The difference in decibels between the signal and the noise level is known as the signal-to-noise ratio (SNR).

As the SNR increases, the signal becomes more intelligible. The method for determining articulation and privacy index requirements for open plan offices can be found in ASTM E1130.

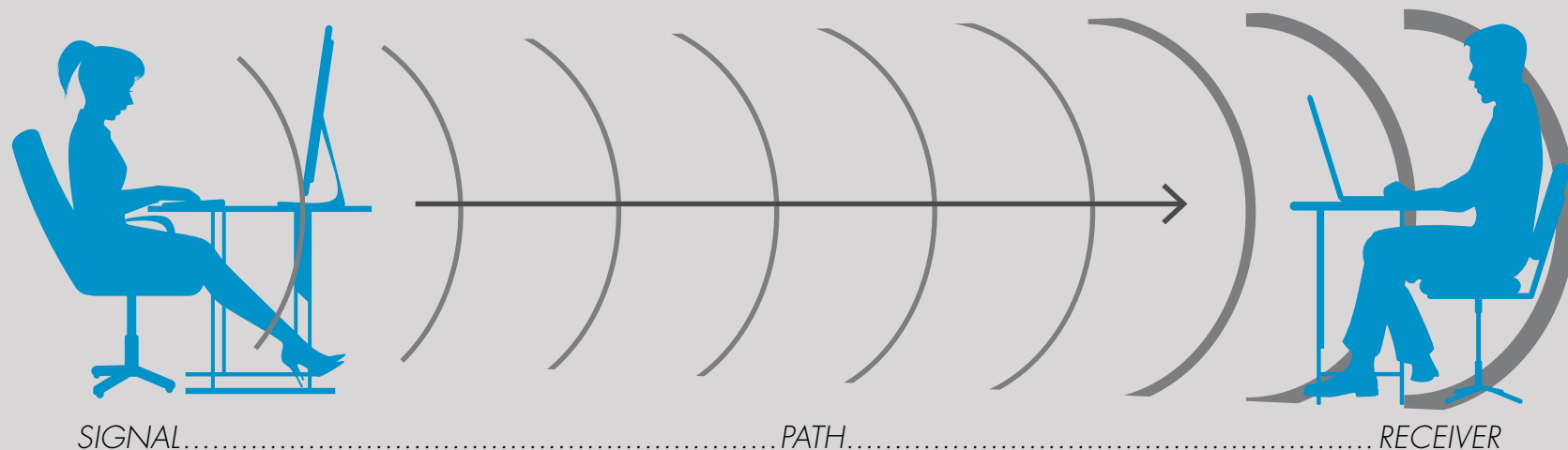
The human element to how sound works

1 Signals: While some noise is created by office machines, research shows the biggest source of disruptive noise is conversation. As collaboration — and therefore conversation — increases, so does disruption. An approach called the ‘ABCs’ of noise control — Absorb, Block, Cover — can address this signal.

2 Paths: The signals carry along a path to get to someone else. Noise control strategies that address the path reduce the decibel level of the signal by blocking it, absorbing it, or letting it ‘run out of steam’ over distance. However, achieving enough distance is usually uneconomic.

3 Receivers: Someone then hears the ‘noise’ — the receiver. Sometimes the receiver wants to hear what’s being said, but often it is a distraction that interrupts their work. Strategies that address receivers are very similar to those that address senders: block the noise with barriers; add absorptive material; mask the noise with non-disruptive background sound; and cluster quiet-seeking receivers together. As some people are less distracted and some are more distracted by noise, individual control is valuable.

Some workers are not disturbed by this sound dynamic. But for those who are, new ways of working allow them to move their location.



Designing for sound

It's not just the level of generated noise that must be addressed. When designing open plan offices, there is a tendency to feature large glass façades. While this scores highly on the wellness scale, giving a great feeling of space and light, it doesn't score well on the acoustic design front.

Large, hard, smooth façades result in sound being reflected back at the same angle it hits the surface. The sound continues to bounce back and forth until it is exhausted, resulting in long reverberation times and noise levels so high that it affects people's ability to concentrate.

Techniques that deflect, direct, spread and absorb sound are needed to counter this and these can be employed on walls, ceilings and floors, as well as furnishings. Planning for quiet spaces, while also allowing small groups to work together is also important.

This can be achieved by positioning meeting rooms as sound locks within the office or by introducing functional inconvenience that also encourages mobility

“Sound and function must match when planning the layout of several spaces at a time. It is a good idea to use the zoning principle to make the transition between the spaces as smooth as possible...”

by creating informal meeting areas, for example by the coffee machine and well away from desks.

If a number of different functions need to be housed in the same building or on the same floor, sound-intensive activities should be separated from sound-sensitive activities — for example it is rarely a good idea to have a call centre in the same room as the accounts department.

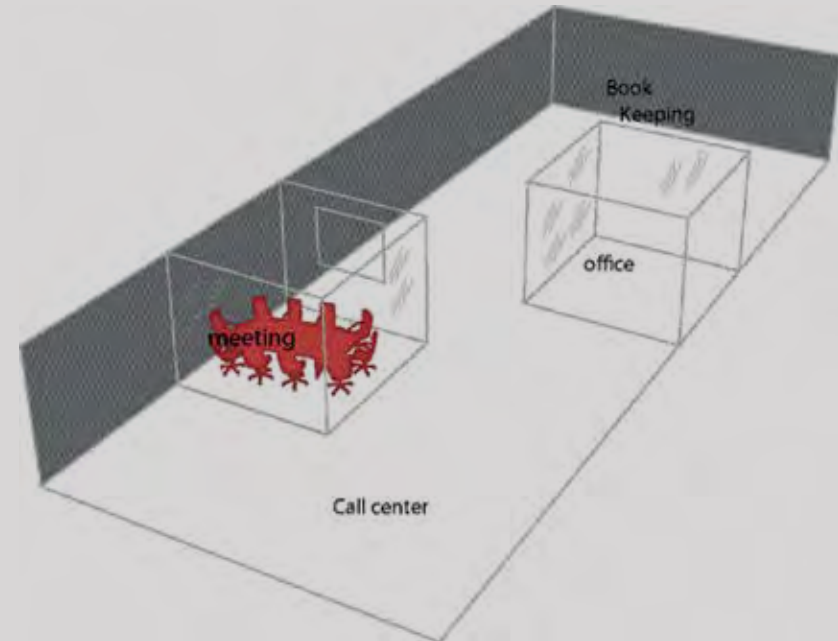
Sound and function must match when planning the layout of several spaces at a time. It is a good idea to use the zoning principle to make the transition between the spaces as smooth as possible and create acoustics in which the sound matches the function in each of the spaces.

Acoustics explained: how they work at work

If sound, function and environment do not go together, the space will somehow feel inauthentic and will tend to be under-utilised. Something to aim for is to make the sound conditions reflect the character and size of the rooms so clearly, that even a blindfolded person could hear what kind of room it is.

It is essential to lower the sound level quickly in certain rooms, while in others, doing so causes problems. People need to be able to concentrate in an open plan office, so the propagation of sound must be kept to a minimum. The level of privacy must be high enough that people nearby cannot understand calls and be disturbed by them; in other words, that the sound does not spread beyond the private sphere.

The downside to this is reduced speech intelligibility. In conference rooms and other spaces intended for voice communication, good sound propagation and good speech intelligibility are important — this means minimal sound level reduction, but using good sound insulation to prevent the sound spreading to and infiltrating other spaces.

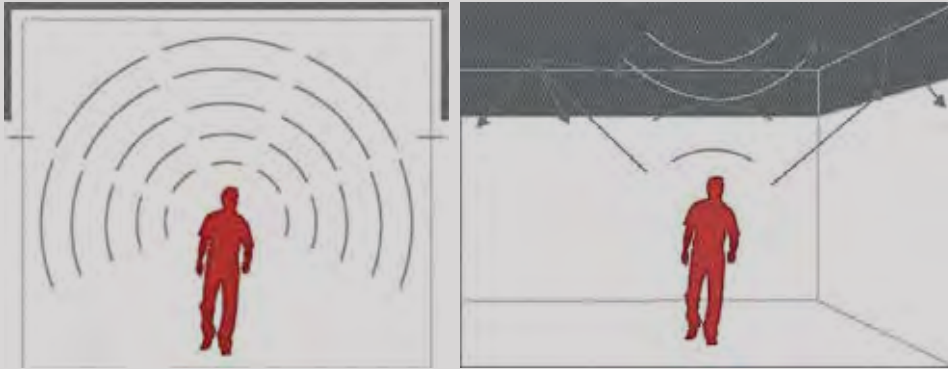


Here are some practical tips for good acoustic design in open plan offices:

- 1** Fit angled or sound diffusing elements to walls, especially those opposing glass façades, windows and other hard reflecting surfaces.
- 2** Angle the glass/hard surface by six degrees to prevent sound bouncing back at the same angle.
- 3** Angle the wall to reflect sound towards the ceiling, trapping some of the sound and reducing the reverberation time and the general noise level.

Acoustics explained: how they work at work

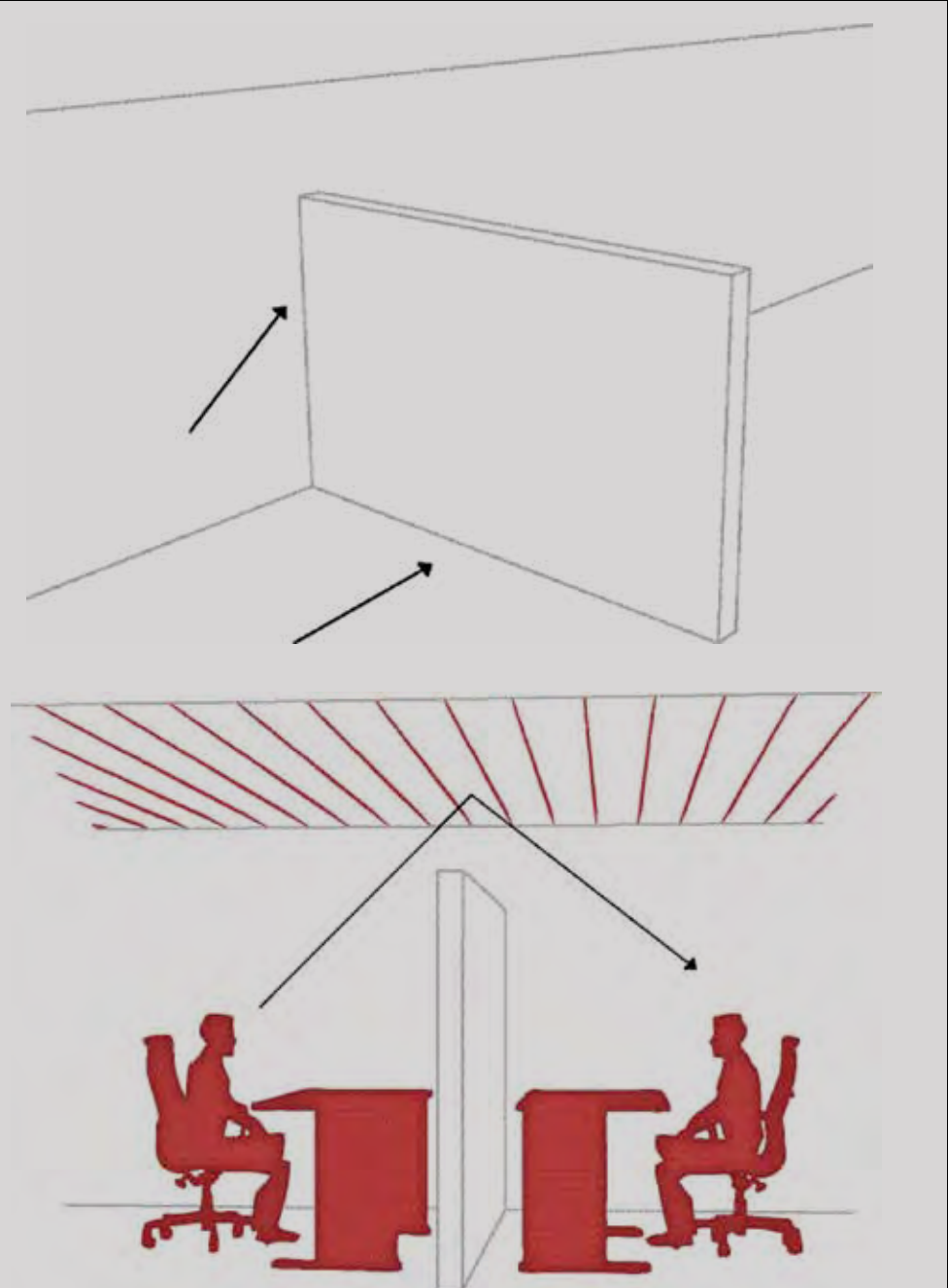
- 4** Install sound absorbers in the ceiling and on walls opposing hard reflective surfaces.



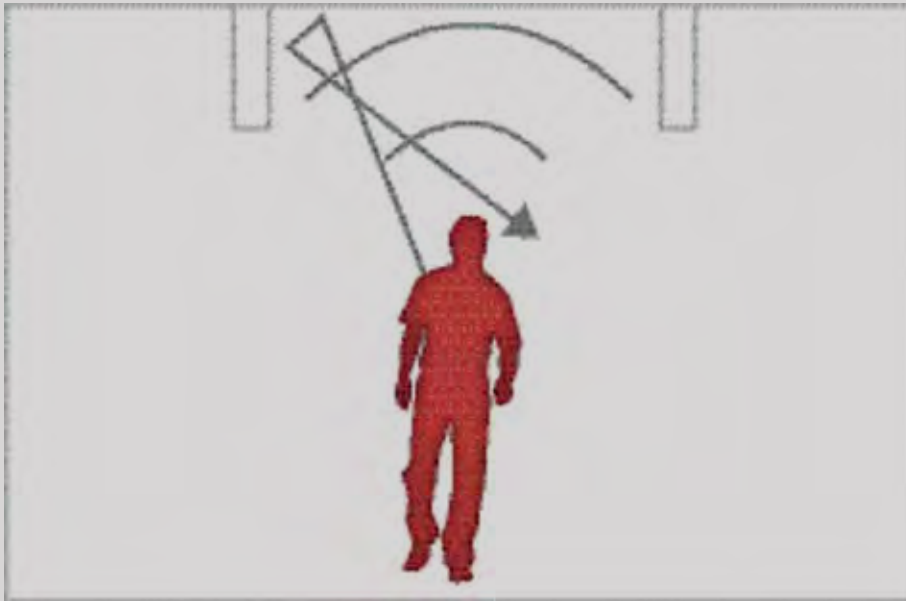
In open plan offices, the stated coverage of absorbers must be fitted, as well as the quantity of sound diffusing materials recommended for normal room heights.

- 5** Erect screens between desks in office landscapes to absorb/diffuse sound and keep noise to a minimum. If people need to make lots of phone calls as part of their work, a screen next to them can prevent the sound from the calls spreading to the rest of the room. The screen acts a filter removing the background sound in the room. However, the screen also has the effect of concentrating the sound and making the sound source clearer.

If you sit behind a wall and slowly stand up, the sound from the other side of the walls gets louder the closer you come to the top. This shows that some of the sound is deflected, and this should be taken into account when screens are used.



6 Protrusions designed as barriers on walls or ceilings are good at catching stray sounds. Stray sounds are sounds that bounce around when they are reflected from surfaces. They can be a problem in open plan offices, where people enjoy the visual contact but would like to be able to work undisturbed.



Baffles are good at preventing sound propagation in large rooms, and are effective when combined with screens in open plan offices, for example. But baffles in rooms designed for speech can create problematic echoes.



The Privacy Index in open plan offices can be boosted by combining room dividers with barriers in the ceiling, and diffusers on the walls. If there is a space between two screens, the sound will behave in the same way as waves passing through a harbour entrance and fanning out on the other side.

7 Another way to dampen sound is to mask it. This method involves playing a soft hiss in the room to mask part of the sound. It can be useful in open plan offices where lots of telephone calls are going on at the same time, or other distracting activities are taking place. The same phenomenon can be experienced in the car — the wind noise and engine noise mask the other sounds within the car.

AS/NZS 2107:2000 ACOUSTICS REQUIREMENTS FOR OFFICE BUILDINGS

ZONE	CHARACTERISED BY	EXAMPLES	RECOMMENDED DESIGN SOUND LEVEL, L_{Aeq} , dB(A)	RECOMMENDED REVERBERATION TIME (T), s
1	High activity level, very low noise tolerance	Board and conference rooms	30 – 40	0.6 – 0.8
2	Low activity level, low noise tolerance	Private offices	35 – 40	0.6 – 0.8
3	Average activity level, medium noise tolerance	General office areas	40 – 45	0.4 – 0.6
4	Average to high activity level, low to medium noise tolerance	Call centres	40 – 45	0.1 – 0.4
5	Average activity level, high noise tolerance	Corridors and lobbies	40 – 50	0.4 – 0.6

Note: 1) Recommended reverberation times are referred to the medium frequencies (e.g. 500Hz or 1000Hz).

AAAC GUIDLINES FOR SOUND ISOLATION R_w RATINGS BETWEEN OFFICE ROOMS

RECEIVING ROOM		SOURCE ROOM ACTIVITY NOISE LEVEL			
		LOW	AVERAGE	HIGH	VERY HIGH
NOISE TOLERANCE LEVEL	EXAMPLES	Private offices	General office areas, public spaces, corridors and lobbies	Conference rooms, computer rooms, rest rooms, tea rooms	Undercover car parks, cafeterias, plant rooms
High	Corridors and lobbies, public spaces, cafeterias	35	40	45	50
Medium	General office areas, reception areas	40	45	50	55
Low	Private offices, call centres	45	50	55	60
Very low	Board and conference rooms	50	55	60	65

Note: 1) To use this table, first identify the noise tolerance level of receiving room, and then find the R_w ratings to match the source room activity noise level. For example, recommended R_w ratings of the wall between private office and cafeteria would be 60.

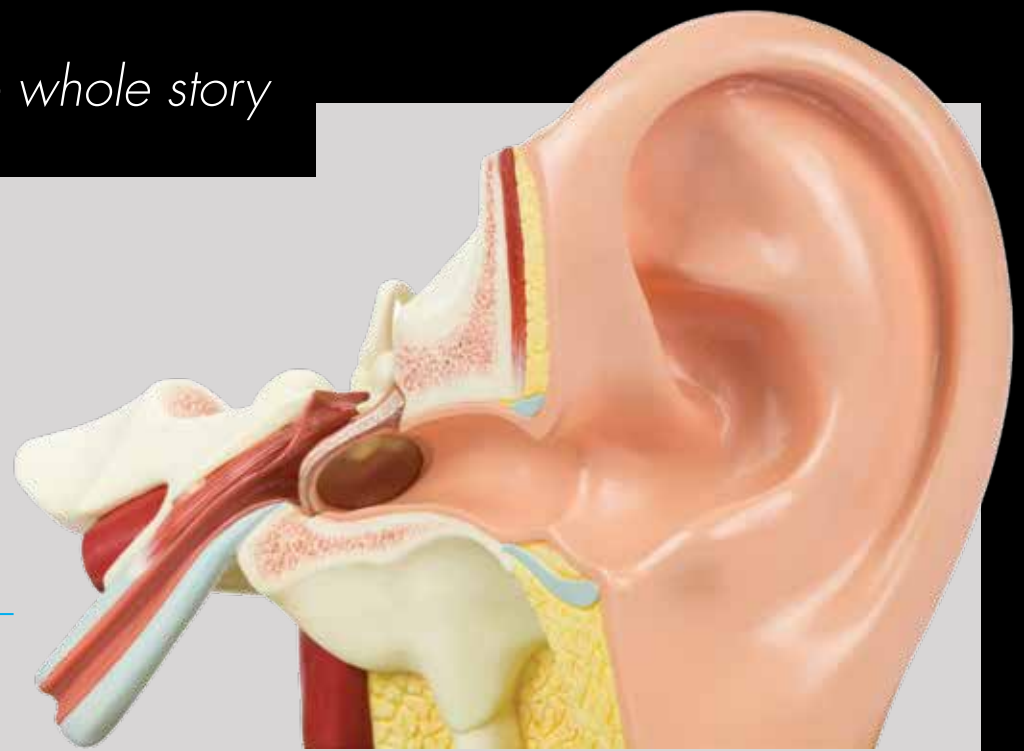
Calculating acoustics: why 'averages' don't tell the whole story

One common way to calculate acoustics is to take an average of how a material absorbs and reflects different sound waves (under laboratory conditions). This average is known as the Noise Reduction Coefficient (NRC). But, as with any averaged figure, it doesn't tell the whole story.

In simple terms, an NRC (Noise Reduction Coefficient) is the average of a material's absorbing or reflective qualities at four different sound frequencies (250hz, 500hz, 1000hz, and 2000hz).

However, designing room acoustics based on NRC can deliver poor acoustic performance in practice. That's because different materials can perform differently at different frequencies. As a result, two materials with the same NRC may not perform the same way in reality.

A more sophisticated way to measure acoustic performance is to calculate what is called a weighted sound absorption coefficient (α_w). It's calculated by comparing sound absorption coefficients to a



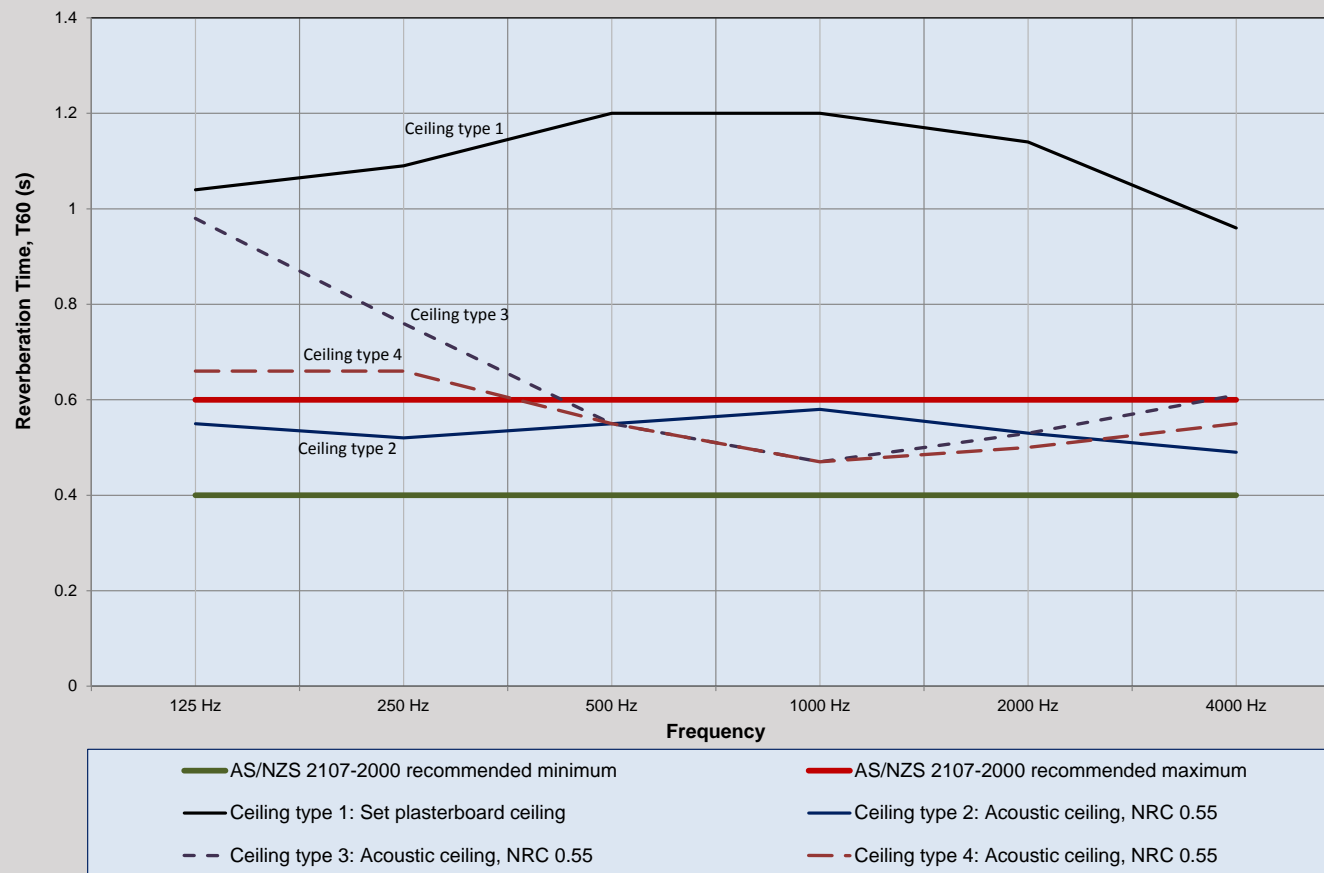
standard curve to give a better picture of a material's performance across all of the important frequencies. The higher the α_w figure, the more evenly a material absorbs sound across all of the important frequencies.

The table below illustrates this point: ceilings 2, 3 and 4 all use a material that has a single number sound absorption rating or 0.7, and yet the results couldn't be more different.

For instance, Ceiling 2 meets reverberation time requirements at lower frequencies only and Ceiling 4 meets them at only 1000 Hz and 2000 Hz. Only Ceiling 3 meets reverberation time at all frequencies.

Reverberation time comparison

Calculated using Knauf Reverberation Time Calculator for 15m long, 10m wide and 3m high open plan office room with 20 staff and light furnishings.



Ceiling type 1 does not meet the reverberation time requirements of AS/NZS 2107-2000.

Ceiling types 2, 3 and 4 all have NRC ratings of 0.55, but only ceiling type 2 meets the reverberation time requirement at all frequencies.

For smaller spaces, AS/NZS 2107-2000 recommends to make reverberation time independent of frequency, which means it is better to have uniform reverberation time throughout the frequency range.

Above comparisons also suggest that acoustic designing based on single number ratings like NRC may not yield desired acoustics environment. Obviously, ceiling type 2 would create a more favourable acoustic environment than other ceiling types.



RECEPTION

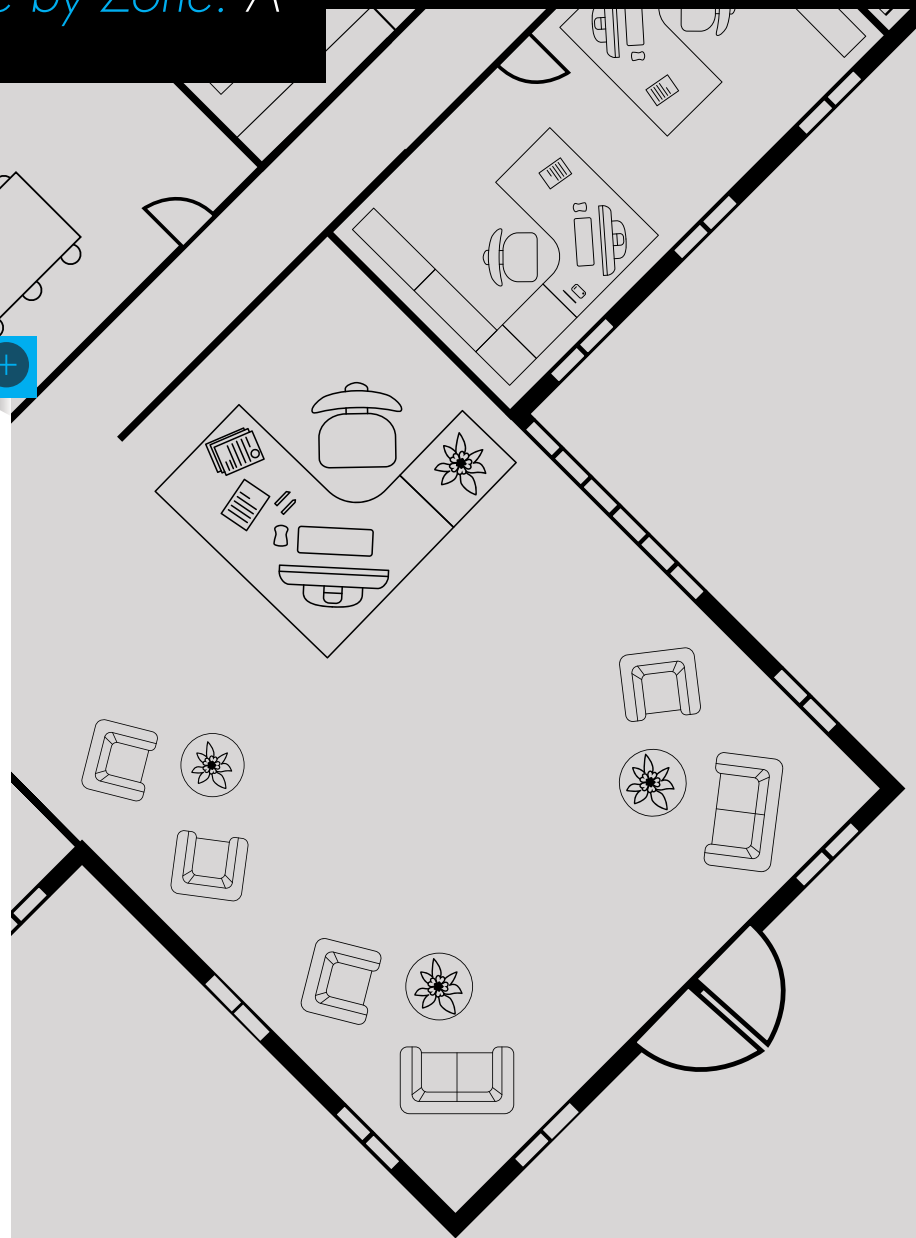
The reception is the face the company presents to the outside world. As soon as people enter, they get a sense of the spirit of the place and the atmosphere at work. That is why it is so important for the reception to reflect the image the company wants to present to the outside world — relaxed and informal, or formal and efficient. It is also important for the receptionist to have peace and quiet to serve clients and to be able to hear when someone approaches.

Acoustic considerations

- + Sound regulating materials above the reception desk
- + Low to medium absorption in other areas

Ceiling: *Stratopanel/Plaza* for demountability

Walls: *Stratopanel/Designpanel*



OFFICE LANDSCAPES

Fitting out an office landscape to create a pleasant working environment is a major acoustic challenge. The problem is how to reduce the general noise level while ensuring that there is adequate masking of the sound.

Reducing the reverberation time immediately reveals lots of sounds that had been masked by the general noise environment. The shorter the reverberation time, the clearer even quiet sounds become — for example the sound of a computer keyboard.

Acoustic considerations

- + Electroacoustic systems can be used to mask unwanted noise
- + Increase the distance between workstations
- + Locate together jobs that thrive on interaction and those that require a high degree of concentration
- + Place sound regulating barriers between workstations

Ceiling: Use the maximum area to install high sound absorbing panels or tiles such as *Stratopanel*

Walls: Place wall absorbers opposite large windows and other hard facades. Use perforated plasterboard such as *Designpanel* to get good diffusion as well as absorption

GROUP ROOMS

Group rooms are small rooms intended for project work and similar activities. In group rooms, the acoustics need to be able to cope with hectic as well as more subdued group activity. It is therefore a good idea to know in advance what kind of activity will take place in the room: in small units, the need for privacy is outweighed by the need for good speech intelligibility.

Ceilings: Ensure the ceiling lining offers good sound attenuation to prevent sound travelling "up and over" to adjacent rooms. Install additional insulation where necessary

CONFERENCE ROOMS

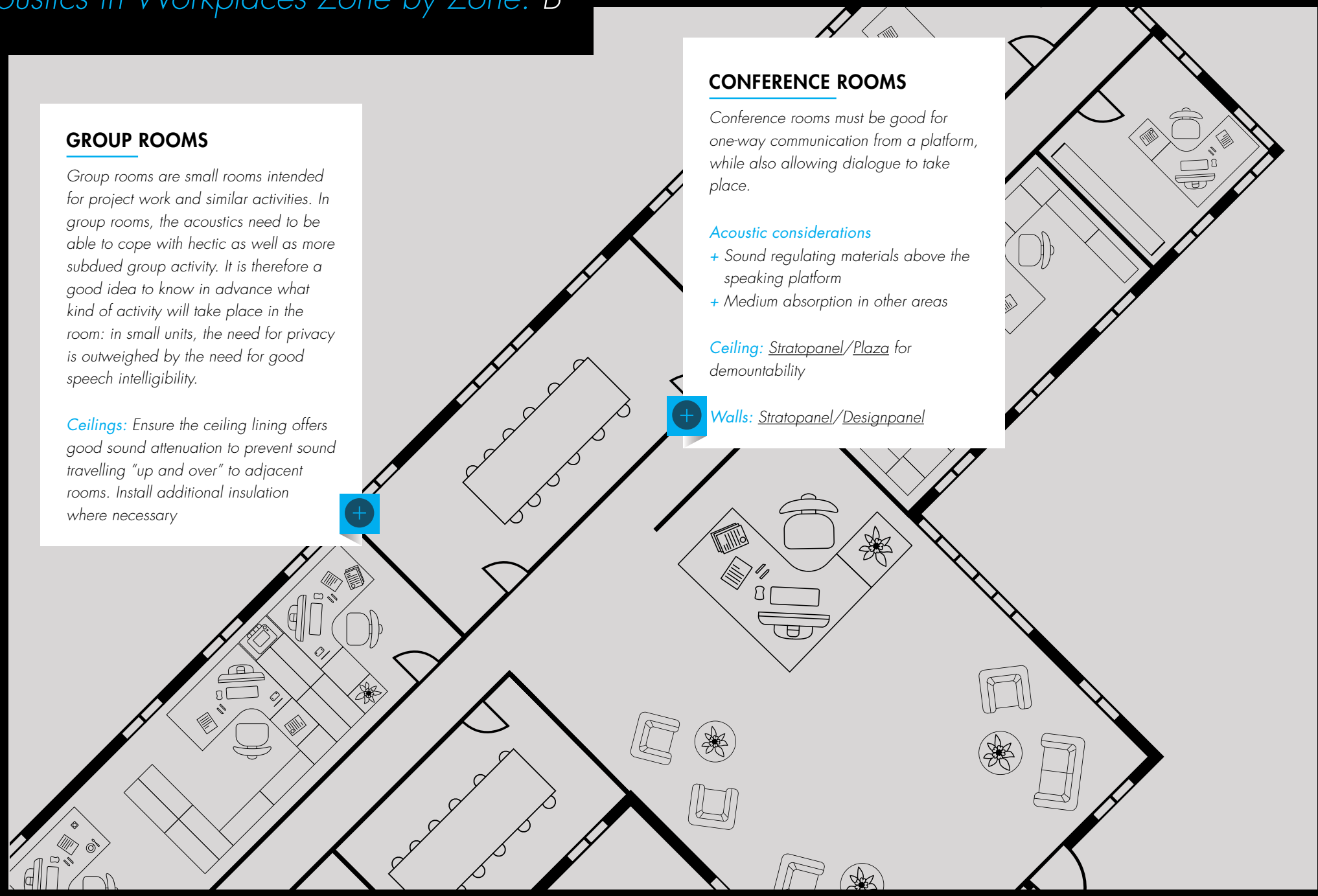
Conference rooms must be good for one-way communication from a platform, while also allowing dialogue to take place.

Acoustic considerations

- + Sound regulating materials above the speaking platform
- + Medium absorption in other areas

Ceiling: Stratopanel/Plaza for demountability

Walls: Stratopanel/Designpanel





ONE-PERSON OFFICES

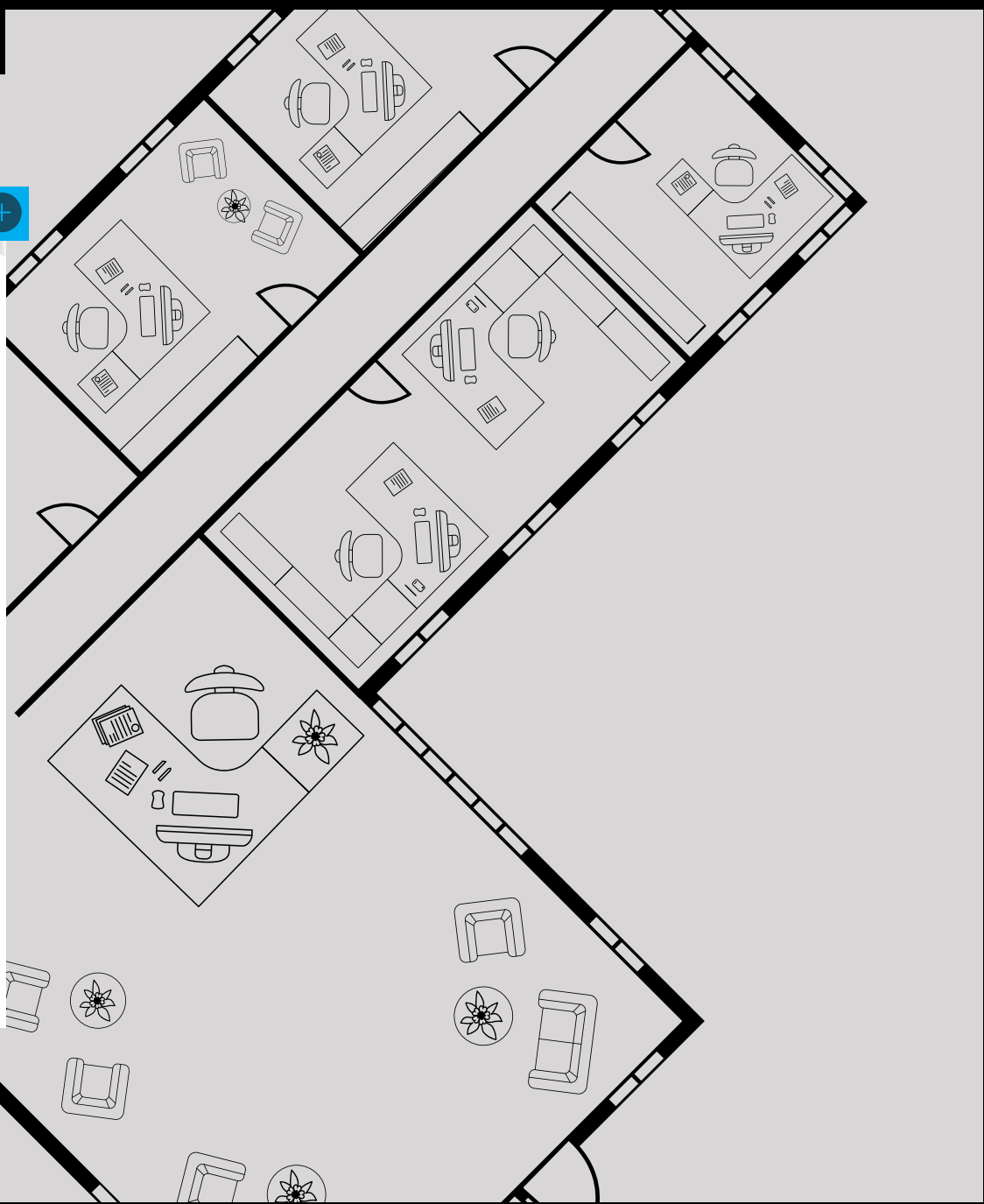
One-person offices are designed for concentration. They are often filled with bookcases and furniture, removing any need for sound regulating materials.

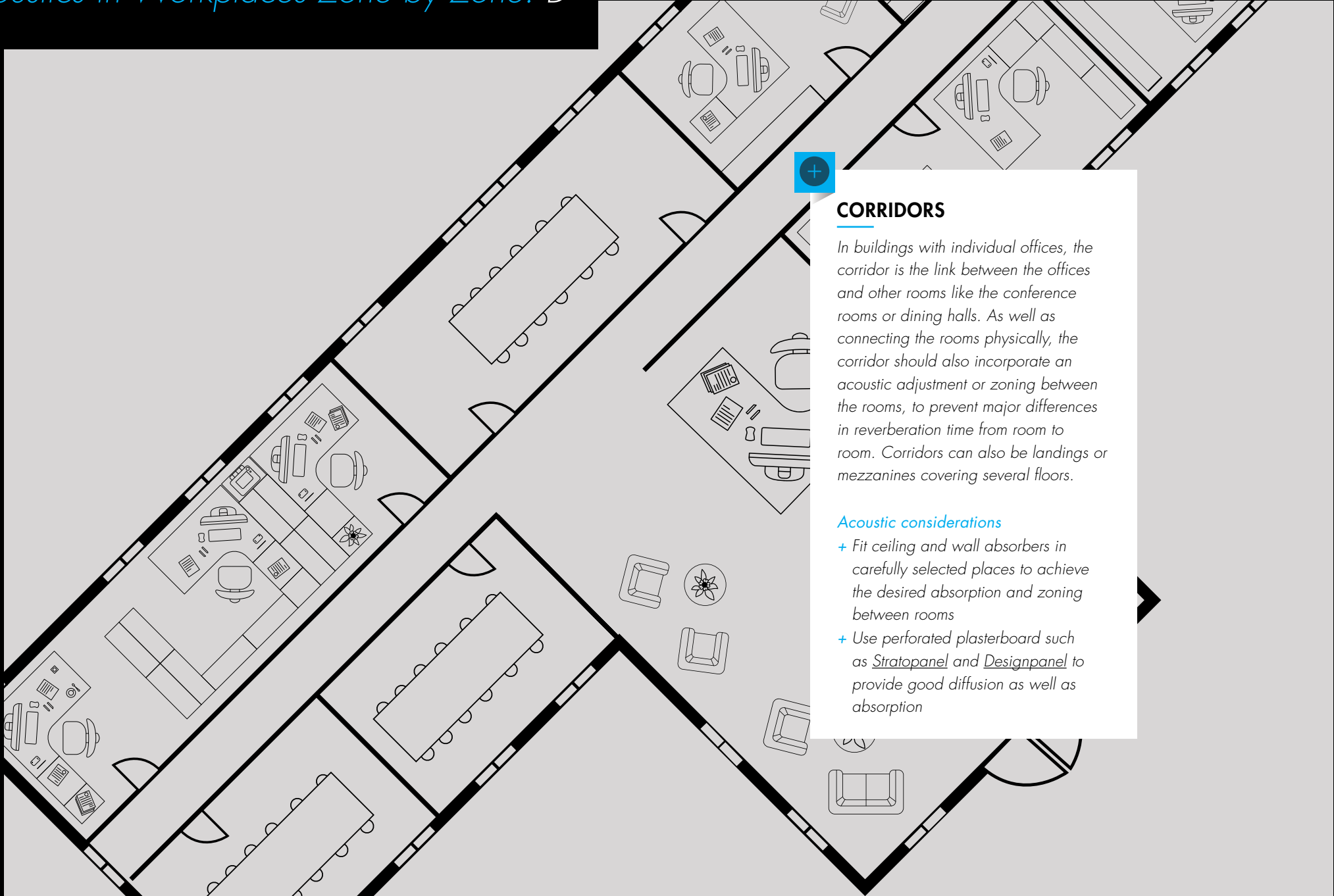
In the case of larger offices, however, it may be necessary to adjust the sound, and the sound environment inside and outside the office will have to be harmonised. Harmonisation between rooms is important, so that people do not move from a place with a long reverberation time to a room with a short reverberation time or vice versa.

Acoustic considerations

+ Low absorption

Ceilings: To ensure privacy, the ceiling design should provide good sound attenuation to prevent sound travelling "up and over" to adjacent rooms. Install additional insulation where necessary





CORRIDORS

In buildings with individual offices, the corridor is the link between the offices and other rooms like the conference rooms or dining halls. As well as connecting the rooms physically, the corridor should also incorporate an acoustic adjustment or zoning between the rooms, to prevent major differences in reverberation time from room to room. Corridors can also be landings or mezzanines covering several floors.

Acoustic considerations

- + Fit ceiling and wall absorbers in carefully selected places to achieve the desired absorption and zoning between rooms
- + Use perforated plasterboard such as Stratopanel and Designpanel to provide good diffusion as well as absorption

Luring BBC staff from the West End to White City and bringing technology up to date: this was the core of the brief for the BBC Media Village, completed in 2003.

The BBC Media Village was a major extension of the BBC's West London headquarters. It was planned as a 'village environment', of a high enough quality to attract people used to working in the West End, out to a regenerated White City.

The development included three major buildings: the Broadcast Centre, which houses all the state-of-the-art digital equipment and playout suites from where television programs are put out to air; the Media Centre, a flexible space; and the Energy Centre, which houses plant for the entire site.

While each building on the site has its own simple geometry, the overall layout is a piece of urban planning with emphasis on the quality of the new public realm. The three main buildings all face on to a main 'street' and a central plaza draws together major





entrances and retail frontages with landscape and routes that connect to the surrounding area.

The two major buildings are clad in aluminium, with interiors of timber, exposed concrete and white plaster. Perimeter buildings are in brick to match the neighbouring residential blocks.

Bob Allies, of Allies and Morrison Architects says that inside, they are quite big buildings and flexible and open in the way they're used.

"All office floors open out onto three atria — these and the atria stairs become the centres of the way people move around the building. People can see each other and the spaces are easy to navigate and understand. The atria allow in sunlight, so there's a



"The new environment introduces a sense of openness and transparency that will radically alter the current perception."

Allies and Morrison

sense of daylight, of the sun moving and time passing by. We've successfully got rid of offices off corridors. Things are much more connected and visible."



FACT FILE

Project name:
BBC Media Village

Location: London,
England

Architect: Allies &
Morrison

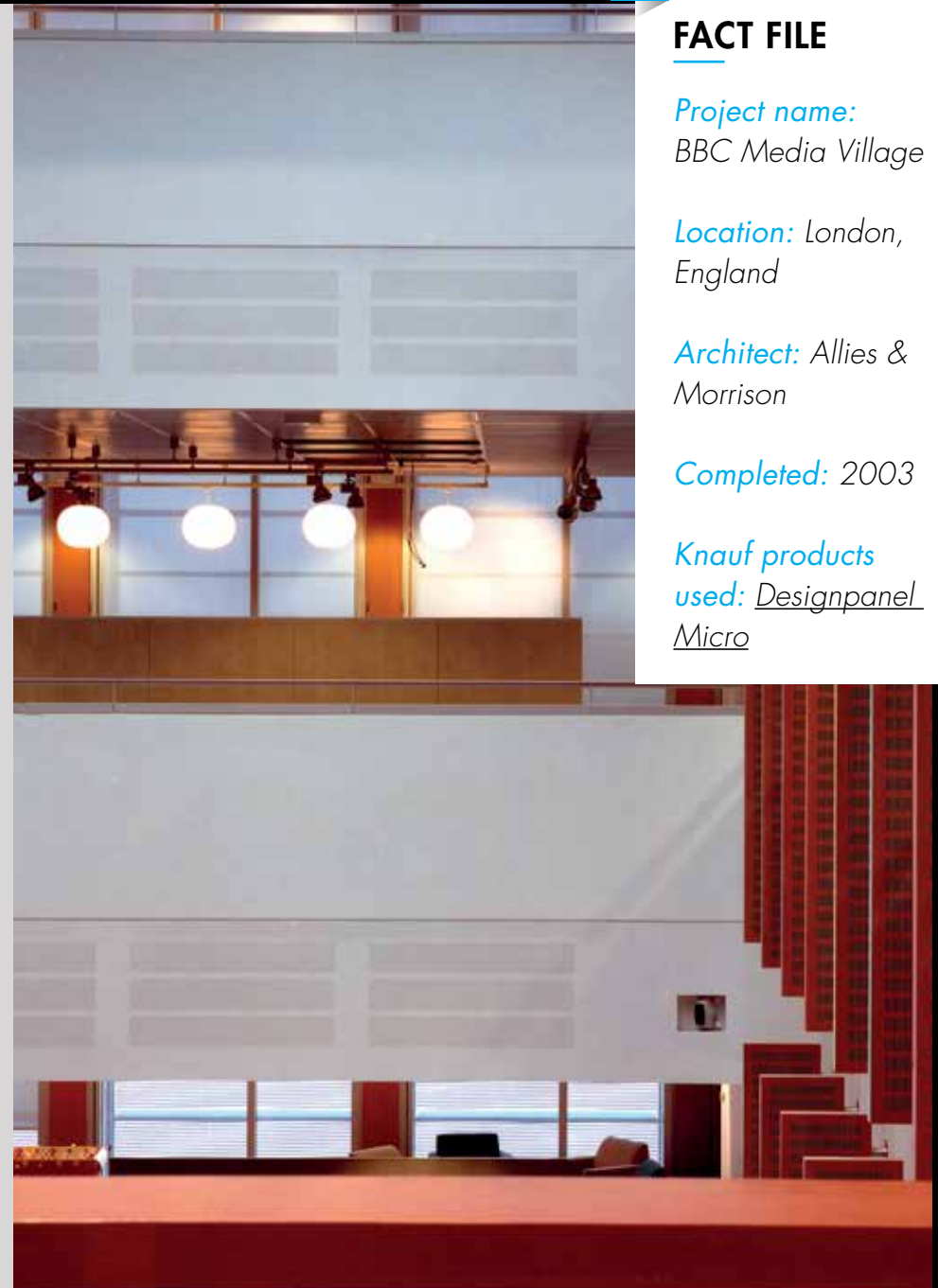
Completed: 2003

**Knauf products
used:** Designpanel
Micro

However, it's the six-floor Media Centre that's the central building in the village. A giant, colourful reception area opens out onto a glorious atrium, lit from above by skylights, edged with coloured wooden louvres and surrounded by the suites and the higher open plan office floors. Extra-wide staircases provide space for chance encounters between people from 17 different BBC departments.

An array of brightly coloured acoustic baffles were designed to deaden the reverberant time in the atrium and provide acoustic attenuation between the open areas of the different floors. Designpanel Micro, in a custom 1000x1500mm size with a three-band perforation pattern was also used for many walls and ceilings.

Designpanel was chosen because of its monolithic, smooth appearance with no visible joints between the panels as well as its excellent acoustic performance. Acoustic standards were challenging, due to the project's high ceiling heights and open spaces.



Workplace design in action: HEKO Ketten

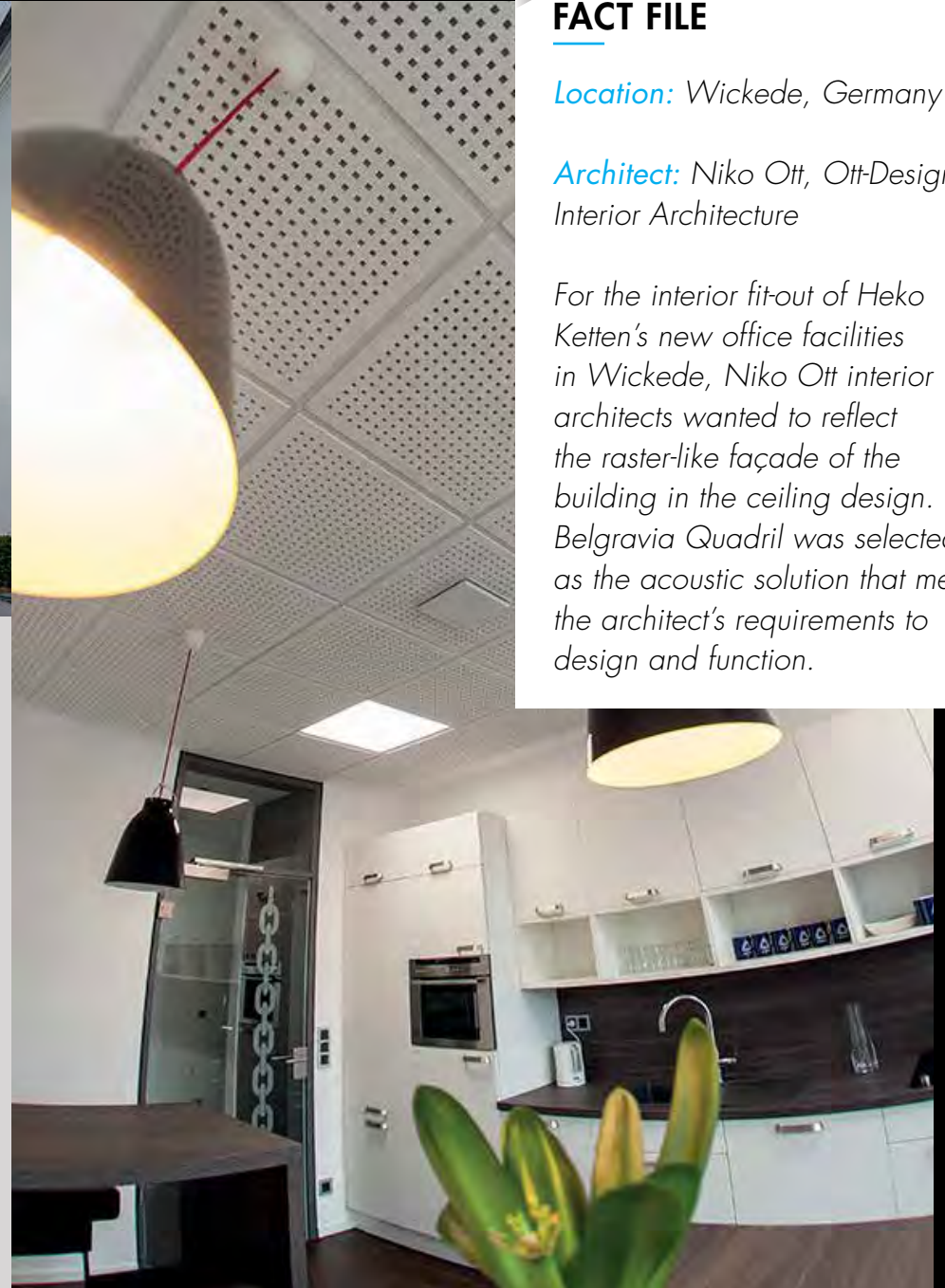


FACT FILE

Location: Wickede, Germany

Architect: Niko Ott, Ott-Design Interior Architecture

For the interior fit-out of Heko Ketten's new office facilities in Wickede, Niko Ott interior architects wanted to reflect the raster-like façade of the building in the ceiling design. Belgravia Quadril was selected as the acoustic solution that met the architect's requirements to design and function.



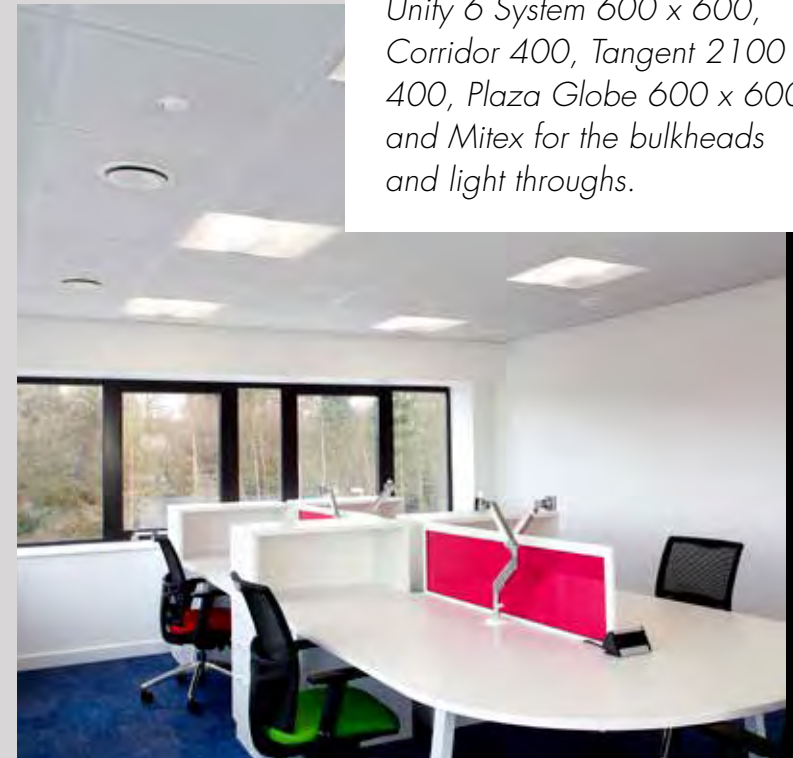


FACT FILE

Location: Reading, United Kingdom

Architect: BCS

When Reading Scientific Services Ltd. added a two storey and first floor extension to their main office building, they selected a mix of Knauf ceiling systems including Visona Tangent 400 x 1200, New Unity 6 System 600 x 600, Corridor 400, Tangent 2100 x 400, Plaza Globe 600 x 600 and Mitex for the bulkheads and light throughs.



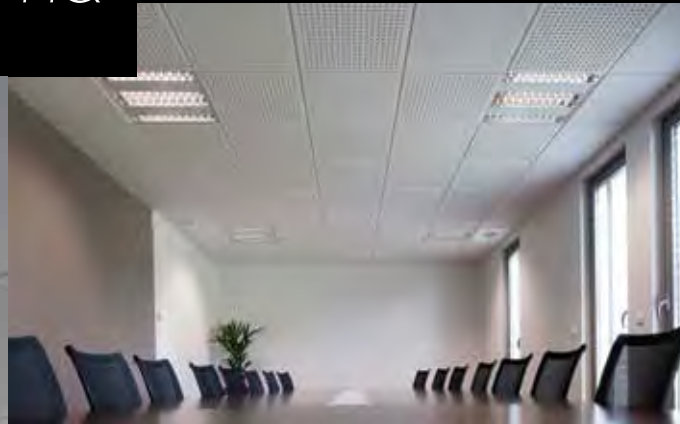


FACT FILE

Location: France (+Dom-Tom)

Architect: A.R.T. architects & associés, Rachel Thuriot

In the new reception area at Groupe 1000 HQ, the mix between perforated and non-perforated ceiling tiles gives a true contrast between the plain white surface and the raster-like texture of Micro perforation. In some of the office rooms, the contrast in the ceiling is made by the combination of large Quadril perforations and small Micro perforations. In addition to their aesthetical compatibility, the two perforation designs also complement each other acoustically ensuring an excellent sound environment.





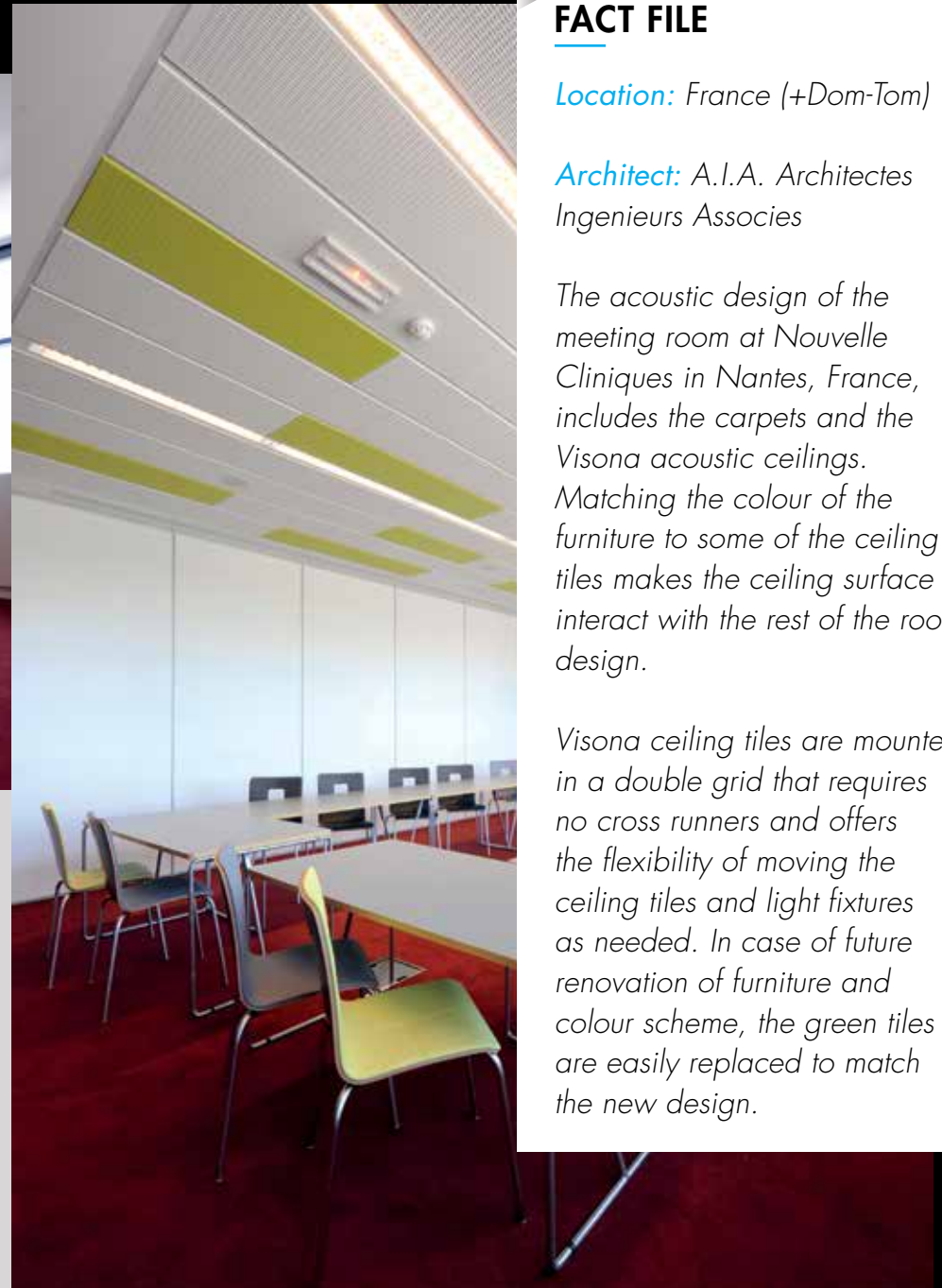
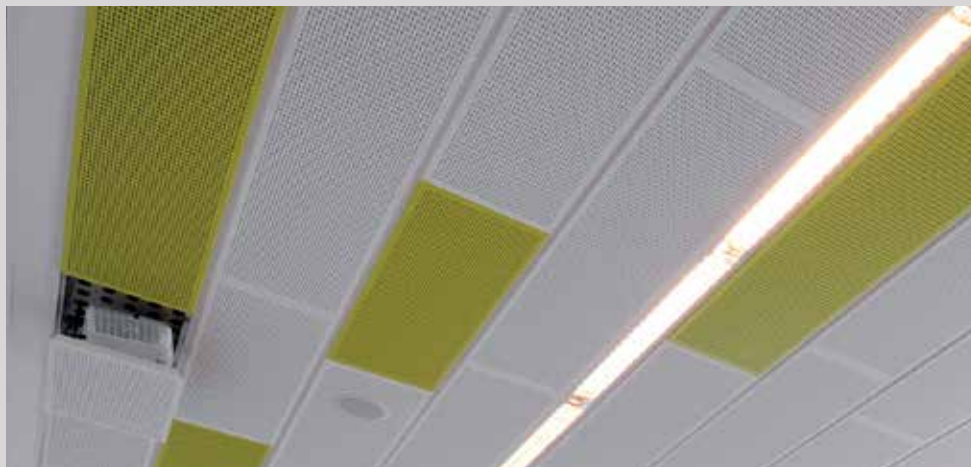
FACT FILE

Location: France (+Dom-Tom)

Architect: A.I.A. Architectes
Ingenieurs Associes

The acoustic design of the meeting room at Nouvelle Cliniques in Nantes, France, includes the carpets and the Visona acoustic ceilings. Matching the colour of the furniture to some of the ceiling tiles makes the ceiling surface interact with the rest of the room design.

Visona ceiling tiles are mounted in a double grid that requires no cross runners and offers the flexibility of moving the ceiling tiles and light fixtures as needed. In case of future renovation of furniture and colour scheme, the green tiles are easily replaced to match the new design.



If you'd like to go beyond NRC try our [online reverberation time calculator](#) on your next project, or if you just want to learn more about acoustic solutions for walls and ceilings, don't hesitate to ask.

Both the Specification and Commercial Sales Team and the Knauf Tech Team work with architects, acoustic engineers and builders throughout the specification and construction process. In addition to advice on the right product to meet your specific acoustic requirements we also offer:

K-Spec Pro

A custom design specification proposal for your project, developed by Knauf and catered to your project's requirements. Knauf engineers can develop a project-wide proposal that details the most cost-efficient wall and ceiling systems for each and every wall and ceiling in your building, ensuring a first-class system selection and reducing time and effort to design and specify.

BIM Wall Creator (Revit add-on)

The first Australian Revit wall creator that intelligently generates Revit-based wall types with detailed specification information. Creates wall types quickly and easily using performance parameters, including FRL, Rw, wall width and performance requirements and is compliant with all AS/NZ BIM standards.

Cost estimates

Project-specific supply and installation cost estimations, developed to help you decide between similar systems to meet project requirements. Simply contact Knauf and we can develop an estimate from a single wall, right through to an estimated project-wide approximate cost.



To get technical help, go to www.knauf.solutions/technical-manuals/ or call us on 1300 724 505.

To find out more about Knauf Products go to www.knauf.solutions



BEN WRIGHT

Technical Services Manager

Ben is a qualified Civil Engineer from the University of Western Sydney and he leads Knauf Technical Services team. His employment history includes

project engineering roles, marketing roles and also technical engineering support roles for manufacturers of concrete and steel products as well as plasterboard and associated products. He has worked for building material manufacturers for 14 years. As well as his interest in steel structures, he is also experienced in fire and acoustic engineering, the Building Code of Australia and also has a particularly keen interest in training.



ERIK MONEY

Technical Services Engineer

Erik graduated from Materials Science at UTS in Sydney. He has worked for building materials manufacturers for 19 years specifically fibre cement

and plasterboard. His employment history includes roles in research, product development, building system development, customer technical support, technical documentation, process engineering and engineering projects. Erik has hands on experience in a wide variety of materials and systems testing in areas such as mechanical properties, durability, impact, acoustic and fire performance. While providing customer technical support for the building industry, Erik has gained an interest and wide general knowledge in construction techniques, building physics and in particular, fire protection.



SHAILESH KOIRALA

Technical Services Engineer

Shailesh is a qualified Civil Engineer with extensive knowledge of lightweight building construction and building physics like

architectural acoustics and thermal insulation. He has worked for different building material manufacturers for more than 14 years, mainly in technical support and management roles including the last 10 years with Knauf. He has a strong command of Chinese Mandarin language and very keen interests in computer programming. He has personally developed several Windows based engineering application tools such as the Knauf Bracing Calculator, Knauf Reverberation Time Calculator, and Knauf Proposal Writer.



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