



BOOSTING BUSINESS WITH BETTER ACOUSTICS

THE IMPACT OF NOISE
AND WHAT YOU CAN
DO ABOUT IT



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INTRODUCTION

THE AVERAGE NOISE LEVEL
IN A MODERN OFFICE IS

70dB



Have you ever wondered how much productivity your company loses due to noise? From road and rail traffic alone, the EU estimates [annual losses of €40 billion](#). Companies are not the only ones being impacted by noise. All humans are affected by noise, which can lead to drops in concentration, stress or even physical illness. For professional athletes like the Denmark SailGP team, a loss of concentration due to noise can mean the differences between victory and defeat – even if it is just for a single moment.

The definition of noise is a loud or unpleasant sound that disrupts a human’s cognitive process. Unwanted sound influences listener intent, and continued exposure could lead to adverse health effects. To optimise the work environment for efficiency, the same amount of consideration should go into the invisible elements of architecture as the digital systems, office layout, and furniture provided to employees.

This guide will discuss the effects of noise on people within their work environments, focusing mainly on productivity. It will cover key areas such as the sources of noise, its impact on the employees, and provide solutions that companies can use to reduce the effects of noise on their employees.

**“THE BOATS GO SO FAST AND
IT’S VERY LOUD – THE SAILS
SOUND LIKE A JET ENGINE”**

– Nicolai Sehested, Denmark SailGP team

IMPROVING PRODUCTIVITY BY REDUCING NOISE



The human ear never sleeps. It is constantly tuning into different sounds that exist in its immediate environment. The full effects of sound on the human psyche are only now becoming clear to scientists and researchers, but the effects of loud noise have been recognised throughout human history.

Egyptian mine workers suffered from 'bewitched ears' due to the loud clangs and bangs that filled the environment. Scientists now know this to be tinnitus, a medical condition that causes a ringing in the patient's ears. Today, this scenario could be likened to working in an office block located on a busy city street, with construction taking place around the corner and the roar of traffic never ceasing – and the risk of tinnitus is just as real if the acoustics are poor and the correct noise-reducing precautions are not taken. Tinnitus is believed to be caused by the dorsal cochlear nucleus area of the ear, but there is still no cure for it.

This same issue affects a person's ability to multitask. Many patients suffering from tinnitus also report feelings of stress, anxiety, depression, mood swings and poor concentration. The evolution of heavy industries, large cities and transport systems means that more people suffer from hearing related illnesses now than ever before. Across Europe, surveys found that about 5 percent of the population [suffer from permanent tinnitus](#), with the prevalence of temporary tinnitus as high as 15 percent. Fortunately, as the issue with noise increases, so too have the quality of the solutions to deal with it.

DID YOU KNOW THAT SAILGP'S
SUPERCHARGED F50 BOATS
RACE AT SPEEDS ABOVE

100 km/h?

This creates such a loud environment onboard that the athletes use special equipment to communicate with each other – and work effectively as a team.

THE EVOLUTION OF THE NOISY WORKPLACE



Noise pollution grew exponentially in the last century. Sometimes called the 'Fossil Fuel Era of Noise', the invention of automobiles and planes drastically increased the number of sounds that humans experience every day. The same applies to offices. As more people started commuting to communal workspaces, their exposure to unwanted sounds increased. At the same time, offices began to rely on noisy technologies like computer, copiers and printers.

Studies from 1993 already indicated that longer exposure to noisier environments leads to annoyance in employees. Responses to occupational noise exposure of more than 55 dB(A) in offices leads to feelings of discomfort, resentment, displeasure and dissatisfaction¹ - and this noise level is merely the equivalent of that made by an electric toothbrush.

New regulations sought to reduce noise levels in offices. The European Agency for Safety and Health at Work now recommends that open-plan offices should limit noise levels to between 35 and 45 dB(A)². Considering the changes in how people work today, this could prove challenging. More people now work in busy cafes, shared workspaces or from home. The shift to open-plan offices also presents a challenge if not managed properly. Across Europe, 51 percent of office workers operate in an open-plan office, with 30 percent of them reporting feeling that their workplace layout negatively affects their productivity. Making improvements to the acoustic environment in these large open spaces is key to ensuring employee productivity.

¹ Occupational noise, WHO, 2004.

² Noise in figures, European Agency for Safety and Health at Work, 2005.

IMPACT OF NOISE ON PRODUCTIVITY

OPEN OFFICES
LACKING NOISE MITIGATION
REDUCE PRODUCTIVITY BY
UP TO 15%



Various studies published between the late 1960s and today report the negative effects of noisy offices. Specifically, these studies sought to quantify the effects of noise pollution on office productivity. To understand the influence noise can have on office productivity, researchers study the relationship between inputs and outputs of individual employees exposed to different noise levels.

Recent studies show that the majority of productivity losses occur from [conversational distractions](#). Therefore, the bulk of effort to improve productivity focuses on eliminating this factor from workplaces. Research also shows that open offices lacking noise mitigation infrastructure reduce productivity by up to 15 percent, with the average employee losing 21.5 minutes of concentrated work per day because of distractions.

Acoustic environments have an impact on employee health and wellbeing. [Urban city noise](#) costs European workplace companies €47 billion annually in lost productivity alone. Conversely, some sounds can help productivity. There are ways to match sounds to specific tasks that help [improve focus and concentration](#). For instance, listening to music without lyrics when performing concentrated work can help reduce conversational distraction.

Although some companies may think this is a workable solution for a noisy office, they should consider the impact on teamwork and culture. A study showed that UK workers could spend as much as one-third of their day “sealing themselves off” from [office noise](#). This could reduce collaboration, increase irritation, and stifle innovation. Instead, companies should consider making permanent improvements to their offices to boost both productivity and teamwork.

THE ADVERSE HEALTH EFFECTS OF NOISE POLLUTION

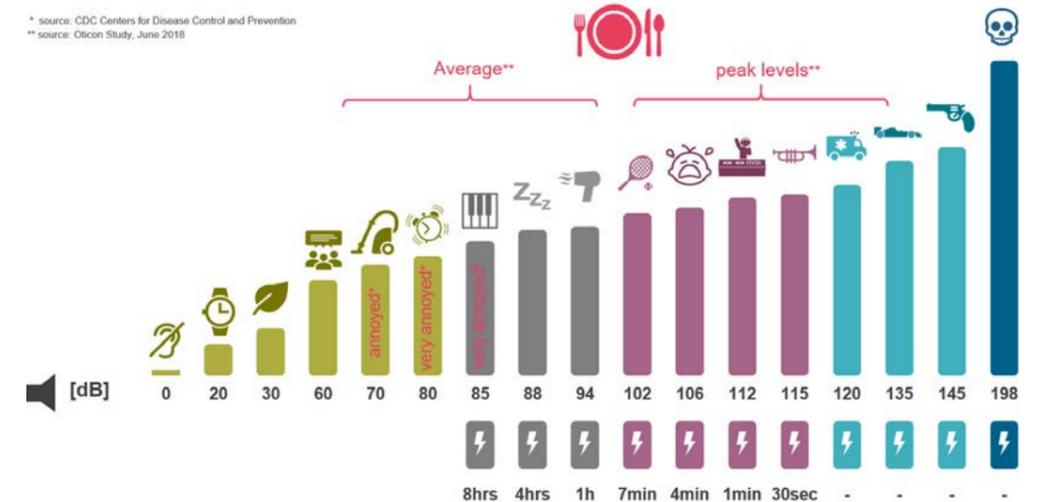


Urbanisation around the world has led to increased noise pollution in buildings and offices. This poses a health risk to populations and employees. Annoyance levels lead to productivity losses in the workplace, but the long-term effects on employee health also come at a price.

Some of the adverse health effects related to noise pollution include:

- Increased stress and anxiety
- Reduced mental acuity
- Elevated heart rates and increased blood pressure though hypertension

Persistent exposure to elevated noise levels could also lead to chronic conditions, including dementia, strokes or heart attacks if not addressed properly³. Increased noise levels have also been directly associated with diabetes, with the incidence increasing along with noise elevation. Improving indoor acoustics can improve employee health and help reduce the costs of extended sick leave or growing health insurance costs.



³ Productivity: How Acoustics Affect Workers' Performance in Open Areas, David M. Sykes, PhD, 2004

BENEFITS OF IMPROVING THE ACOUSTIC ENVIRONMENT OF A WORKPLACE

A one-decibel improvement in noise reduction can increase productivity by 0.3 percent, according to a BPIE study⁴. Taking an office from 55 dB(A) to 45 dB(A) ambient noise will lead to an improvement in office productivity of between 1.7 and 3 percent. This amounts to a monetary cost saving of more than €1,800 per employee per annum.

Other studies show that reducing conversational distractions and improving speech privacy in offices, by installing acoustic panels and blocking sound using partitioning walls, also provides productivity benefits. A worker's ability to focus on tasks increased by 48 percent and conversational distractions decreased by 51 percent. Stress levels reduced by 27 percent while error-rates also fell by 10 percent, as indicated by workers executing tasks accurately and the retention of short-term memory⁵.

The benefits of improving office acoustics have become a focus area for governments and private businesses alike. Today, there are already many solutions available in the market, such as phono-absorbent walls, acoustic ceiling tiles etc. As research continues in this field, building designers and company owners will need to deploy all relevant solutions that enable their workforces to operate productively and safely. Standards organisations already provide detailed information on how to improve the layout, design, and division in offices to improve speech intelligibility and privacy.

A NOISE REDUCTION OF 10
DECIBELS CAN SAVE UP TO
€1,800
PER EMPLOYEE PER ANNUM

⁴ Building 4 People: Quantifying the benefits of energy renovation investments in schools, offices and hospitals, BPIE, 2018.
⁵ Productivity: How Acoustics Affect Workers' Performance in Open Areas, David M. Sykes, PhD, 2004



COMMUNICATION IS KEY TO PERFORMANCE – WHETHER YOU'RE A SMALL BUSINESS, A GLOBAL ENTERPRISE, OR AN ELITE SPORTS TEAM

Good communication is key to success in most activities and none more so than SailGP, the fastest sailing races on the planet. With foiling boats reaching speeds of up to 100 km/h, every second counts – and even small misunderstandings can lead to big mistakes.

“Sailing these boats, it all comes down to teamwork – these boats are impossible to sail unless you work 100 percent concentrated and become really coordinated”, explains Nicolai Sehested helmsman of the Denmark SailGP team.

Without strong communication, there is no teamwork. The noise aboard the F50 makes communication difficult – even for experienced sailors. “It’s very loud and your heart rate is at the maximum,” says Nicolai.

In such a noisy environment, it is important to use the right equipment to deal with the effects of the noise. SailGP athletes wear headsets and communicate clearly and calmly to overcome these challenges. How does your workplace deal with the effects of noise?

Working in loud environments can lead to the loss of productivity through distractions and drops in concentration. As a result, team members may need to shield themselves from noise using noise-cancelling headsets, but that can have a negative impact on communication.

A good acoustic environment helps facilitate clear communication without annoying or distracting other members of the team, allowing you to always perform at the highest level.

BETTER BUSINESS THROUGH ACOUSTIC IMPROVEMENT

Improvements in the acoustic environment do not just help increase productivity – they could also potentially stimulate business. Below are a few examples of how businesses in different areas are directly impacted by noise.

THE EFFECTS OF NOISE IN RETAIL OUTLETS

It does not matter whether a shop is selling clothes, coffee, books or gadgets – when customers step into a store, they just want to feel welcome. Delivering that experience to customers requires ensuring the optimal acoustic comfort. If customers feel welcome in retail stores, the time spent in the stores is likely to increase. This is vital to the performance of retail stores, as even an average increase of 1 percent in dwelling time can see sales rise by 1.3 percent. Research shows that [optimising the acoustic environment](#) in retail stores can increase revenues by between 5 and 10 percent.

Conversely, if it is a noisy environment, customers shop as quickly as possible to escape the noise irritation. A comfortable acoustic environment improves the wellbeing of shoppers and helps to shape a desirable environment that leads to increased spending. Noisy environments where retailers do not optimise acoustics and reduce reverberation can consequently lead to a 28 percent reduction in sales.

OPTIMISING THE ACOUSTIC ENVIRONMENT IN RETAIL STORES CAN **INCREASE REVENUES WITH UP TO**

10%



HOTEL AND RESTAURANT NOISE IMPACTS

For businesses in the service industry, noise can have a severe impact on customer experience.

In restaurants and cafés, a comfortable acoustic environment is especially important as studies show that dining in a loud environment will negatively impact the food experience. In addition, if sounds are too loud for patrons, it could lead to complaints or even the customer getting up and leaving.

Bars and [restaurants face additional challenges](#) due to the Lombard effect. As noise increases, guests involuntarily begin to raise their voices above the ambient volume. The effect increases exponentially and leads to changes in the pitch, rate and duration of the spoken syllables.

Some surveys found that [noise was the biggest complaint](#) in restaurants, above poor service, crowds, prices and parking. Similarly, noise is the most frequent complaint from hotel guests and is a common feature in accommodation reviews online. Improving the experience for patrons in retail stores, restaurants and hotels will increase revenues, improve customer retention and attract new patrons. Consumers seek and appreciate establishments that invest in providing a comfortable acoustic environment.

3 WAYS TO IMPROVE ACOUSTICS FOR PRODUCTIVITY AND COMFORT



The most efficient way to improve a building's acoustic environment is to upgrade the materials within. Even after construction has finished, there are many ways to significantly improve a building's acoustics for increased productivity, comfort, and, more importantly, the occupant's health and safety.

1. SOUND-ABSORBING CEILING TILES AND WALL PANELS

Sound-absorbing ceiling tiles and wall panels can help reduce noise pollution in open-plan offices and other open spaces. Instead of reverberating sounds throughout the room, a stone wool tile or panel captures the noise and dissipates its energy through the material's fibrous structure.

Hanging ceilings are a great way to reduce the volume of a room, helping to improve the comfort of employees or customers. By lowering the height of the ceiling, it also helps contain sounds in that space. Additionally, wall panels made from stone wool can greatly reduce the ambient noise in an open-plan office. This helps improve speech privacy, [increases employee productivity](#), and eliminates conversational distractions.

Rockfon™ [ceiling tiles and wall panels](#) are a cost-effective way to improve the acoustic environment in offices, restaurants and other loud spaces and are 100 percent recyclable. The aesthetically-pleasing range of products reflect light, helping to create a comfortable and productive environment.

DISCOVER OUR SOLUTIONS

3 WAYS TO IMPROVE ACOUSTICS FOR PRODUCTIVITY AND COMFORT



2. INSULATING WALLS, FLOORS AND CEILINGS

The best way to reduce room-to-room sound and noise pollution in buildings is to improve the insulation material used in the walls, floors and ceilings. Installing high-quality insulation materials like stone wool in the building improves the acoustic environment, and has the added benefits of improving energy efficiency, increasing fire safety and making it easier to ensure a comfortable space.

Building facades can also use stone wool solutions to reduce outside noise from penetrating the structure. The material is fire-resistant, improving the safety of the building's occupants. With improved stone wool insulation in the walls, floors and ceilings, the building will become more sustainable and cheaper to maintain.

ROCKWOOL Group offers a variety of insulation technologies suitable for any building type or layout. The material is recyclable and engineered to isolate noise and vibrations. A floor insulated with 20 mm of ROCKWOOL stone wool can reduce floor impacts from above by up to eight times.

[DISCOVER OUR SOLUTIONS](#)

3 WAYS TO IMPROVE ACOUSTICS FOR PRODUCTIVITY AND COMFORT

3. OTHER TIPS FOR IMPROVING OFFICE ACOUSTICS

For smaller gains in improved acoustics, some lightweight solutions are also available. Using soft furnishings, curtains and rugs can help absorb noise. Other upgrades to the building's structure, like installing high-quality windows and doors, could also help screen outside noise. Tall wall partitions and furniture can also decrease the reverberation time in large open spaces.

Finally, plants are a natural sound absorber. Setting up plant displays in various parts of the office can increase employee morale while helping to reduce noise pollution. Researchers have shown the colour green also assists individuals to be more productive, calm, and relaxed.

Combining green walls with Grodan™ growing media solutions will enhance the effect. The [growing medium](#) also uses the properties of stone and comes with the same sound-absorbing benefits, while also reducing the amount of water required to grow plants.

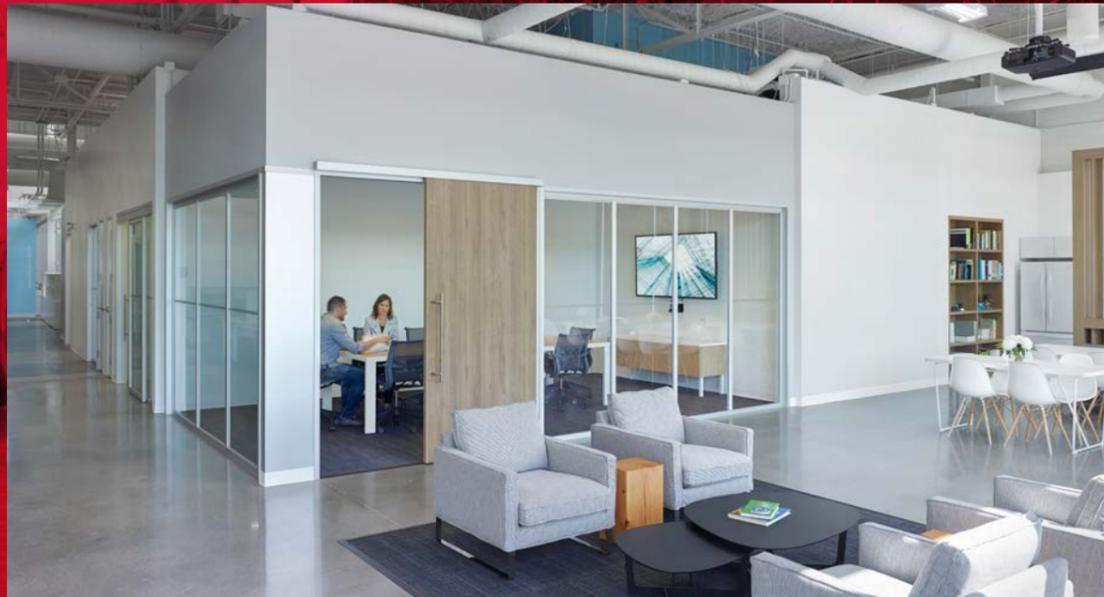
Conclusion

Employee productivity depends on many factors in the office. The effects of noise on the workforce may seem negligible at first, but it affects everything from personal wellbeing to task efficiency and staff retention. Happier, more comfortable employees will be more productive and willing to collaborate with their colleagues instead of becoming annoyed with distracting conversations. To get the most out of workers while keeping them healthy, it is important to invest in sound-absorbing technologies and solutions that are sustainable, economical and efficient.

On the following pages, we have put together our best case studies across application areas to inspire you to transform your business with better acoustics.



CASE STUDIES



OFFICE AERCOUSTICS ENGINEERING – ONTARIO, CANADA

CHALLENGE: An acoustical engineering firm wanted to showcase their expertise in noise and vibration control by transforming a 9,000 square feet former warehouse into a collaborative office space. As part of a larger multi-tenant building, ensuring sound privacy and acoustic comfort in meeting rooms and other areas was vital to the project's success.

SOLUTION: Aercoustics Engineering chose Rockfon ceiling tiles – products that effectively blocked and absorbed sound without compromising on the aesthetic goals of the project. In addition to optimising acoustics, the bright and lightly textured panels helped reduce the need for electric lighting by reflecting up to 85 percent of the available light and thereby maximising the use of natural light. Made entirely from stone wool, the Rockfon tiles also helped secure a healthier and safer working environment by delivering excellent fire safety and hampering mould and bacterial growth. The result was a dynamic and comfortable office environment that looks great, promotes wellbeing, complements the company culture and demonstrates their technical expertise to clients and visitors.

[READ THE FULL CASE STUDY](#)



RETAIL SØRLANDSSENTERET SHOPPING CENTRE – KRISTIANSAND, NORWAY

CHALLENGE: The architects and developers of northern Europe's largest shopping centre needed to balance out the reverberation produced by vast amounts of hard building materials in order to create comfortable acoustics. Covering an impressive 110,500 m², the shopping area including 195 stores and a 40,000 m² parking space. The hard building materials in question included more than 3,500 m² of glass façade covering the outside of the building, glass walls that continued into the internal stores and tile-covered common areas.

SOLUTION: The team chose Rockfon sound absorbing ceiling tiles to create the acoustics they wanted in the shopping centre. Stone wool, the core material used in these ceiling tiles, is by nature a highly sound-absorbent material, so it enabled the architects to achieve high levels of acoustic comfort to benefit shoppers and centre employees alike. The final result was a shopping centre that boasted carefully considered acoustics to support the ultimate shopping experience for countless happy shoppers.

[READ THE FULL CASE STUDY](#)

CASE STUDIES

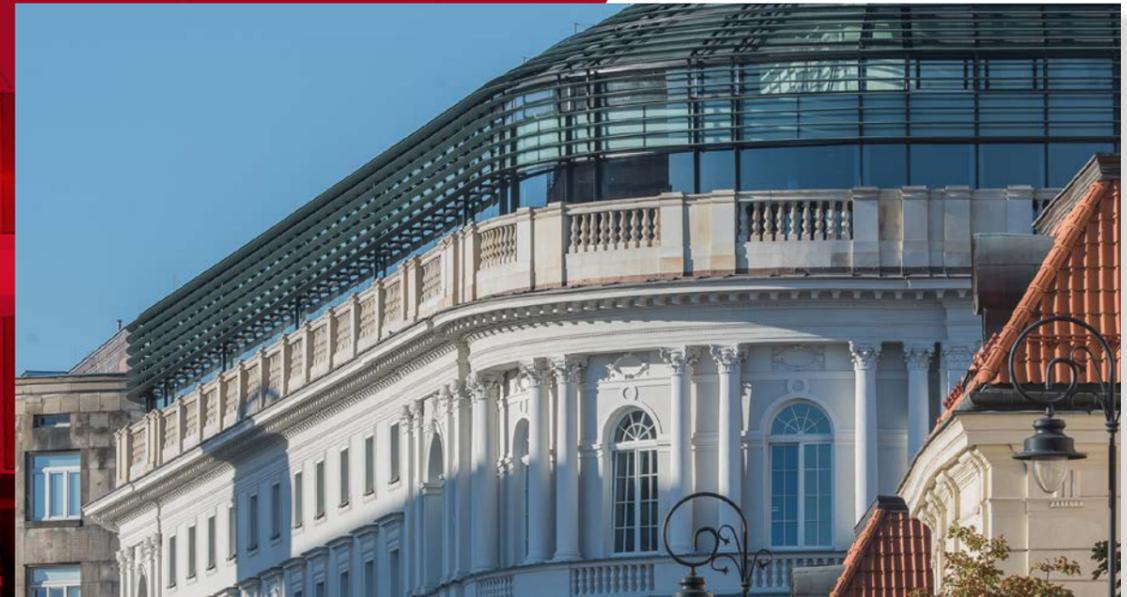


RESTAURANT CAFÉ TOLDBODEN – COPENHAGEN, DENMARK

CHALLENGE: Built approximately 120 years ago, the building that hosts Café Toldboden in its basement enjoys an atmospheric and historic location on Amaliegade in the centre of Copenhagen. The owners of the restaurant wanted to improve their acoustics to avoid the noise challenges associated with older, low ceilinged buildings such as theirs. The improvements needed to be quick and seamless to keep the restaurant open during its regular hours.

SOLUTION: A traditional, suspended acoustic ceiling was not an option for Café Toldboden due to its basement location, low ceiling and visible beams. Rockfon Eclipse acoustic panels proved to be the perfect solution as they could be mounted directly on to the existing ceiling to absorb noise and create the ambience they wanted for the restaurant. The panels come in different module sizes and shapes, and could easily be installed by a local carpenter, meaning no extra downtime for the restaurant. Not only do the panels achieve the comfortable acoustics the restaurant wanted for both guests and staff, their smooth, bright white surface ensures an even distribution of light throughout the basement.

[READ THE FULL CASE STUDY](#)



HOTEL EUROPEJSKI HOTEL – WARSAW, POLAND

CHALLENGE: Established in 1857, Raffles Europejski Warsaw hotel recently completed a thorough five year renovation. The architects were tasked with restoring the hotel to its former glory, while embracing the ultimate in modern safety and comfort. The hotel's vast size coupled with its bustling city centre location meant that noise reduction was an important aspect of the renovation.

SOLUTION: ROCKWOOL insulation and Rockfon ceiling tiles were selected as the ideal materials to insulate the roof and ceilings of this historic building. Made from stone wool, the natural properties of these materials secured the ultimate in acoustic comfort expected in a luxury hotel. The products provided the perfect insulation needed to shield guests from the day-to-day interior sounds found in a busy hotel and from exterior city noises. Thanks to ROCKWOOL products, the hotel remains a peaceful oasis for guests today.

The natural properties of the ROCKWOOL products offer more benefits than just noise insulation. Withstanding temperatures of over 1000°C means that they increase fire safety at the hotel, helping prevent potential fires from spreading. The insulation properties of the products means that guests stay warm and cosy – and ensures that the Hotel Europejski benefits from energy savings for decades to come.

[READ THE FULL CASE STUDY](#)