

**KNAUF**

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# ACOUSTIC & DESIGN SOLUTIONS

FOR EDUCATIONAL  
BUILDINGS



***Build for the world we live in***



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# WELCOME

Sombacour Kindergarten, France, Belgravia Globe  
Architect: Cabinet d'architecture ARCHI+TECH

# KNAUF: BUILD FOR THE WORLD WE LIVE IN

Young people's futures are formed in schools and colleges, and the environment in which learning takes place is key to shaping their success. Well designed buildings raise the aspirations of those who use them, inspiring high performance and positive attitudes.

Studies have shown the correlation between classroom design, and performance of both students and teachers<sup>1</sup>. It is now generally accepted that an awareness of space, sound and safety is fundamental to the creation of facilities that are fit for purpose and designed to last.

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*Did you know: Well-designed schools have the power to shape society – improving the attainment, behaviour, health and wellbeing of every child” - Alan Jones, RIBA President, 2021*

Ageing and poorly designed buildings cannot meet the demands of modern teaching and learning methods. In order to raise the performance of students, increase the retention of staff and optimise the effectiveness of facilities, a holistic approach to the design of educational buildings is needed. Central to this approach is choosing the right combination of construction materials. As well as functionality, their impact on the learning process as a whole needs to be considered.

With a diverse portfolio of robust, sound-absorbing and hygiene-friendly ceiling systems, Knauf is the ideal choice for educational construction projects. Given today's need for adaptability and versatility, we build for the world we live in and offer aesthetically appealing, high performing products for superior learning environments. As our systems come with the Knauf system performance warranty, you also get complete reassurance and peace of mind.

<sup>1</sup> Jonathan Nettler, Salford school of Build Environment, 2012

Vordingborg Barracks, Denmark, Akustikpanel/Curved Quadril  
Architect: Kim Bjørn Arkitekter A/S

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# ACOUSTICS

# ENHANCING COMMUNICATION IN THE CLASSROOM

The ability to hear and understand what is being said is central to the learning process. Any unwelcome noise, whether from within the classroom, from another classroom or from outside the school, will have a detrimental effect on children's education.

As well as disruptive levels of noise, there is also the problem of poor acoustics, where sound becomes muffled or distorted by environmental factors. This can mean that students in one part of a classroom will struggle to hear what the teacher is saying. Children, especially those younger than 13 years of age, are more disturbed by background noise than adults due to their still-developing sense of hearing.<sup>2</sup>

A number of pupils in schools will have additional hearing requirements, such as those with hearing impairments, those on the autistic spectrum, and those whose first language is not English. Good acoustic conditions will benefit these pupils, who may require less noise distraction to be able to focus.

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*Did you know: Noisy environments have a negative effect on both teacher and students*

Good classroom acoustics are a fundamental classroom need. And what constitutes good acoustics can vary depending on the intended use of the room. Full absorption and low reverberation time is not always the objective. The aim is to construct an acoustic environment that gives students and teachers the most advantageous learning experience.



A classroom which has a long reverberation time causes syllables to be prolonged and can overlap. This causes speech degradation and confusion for pupils.

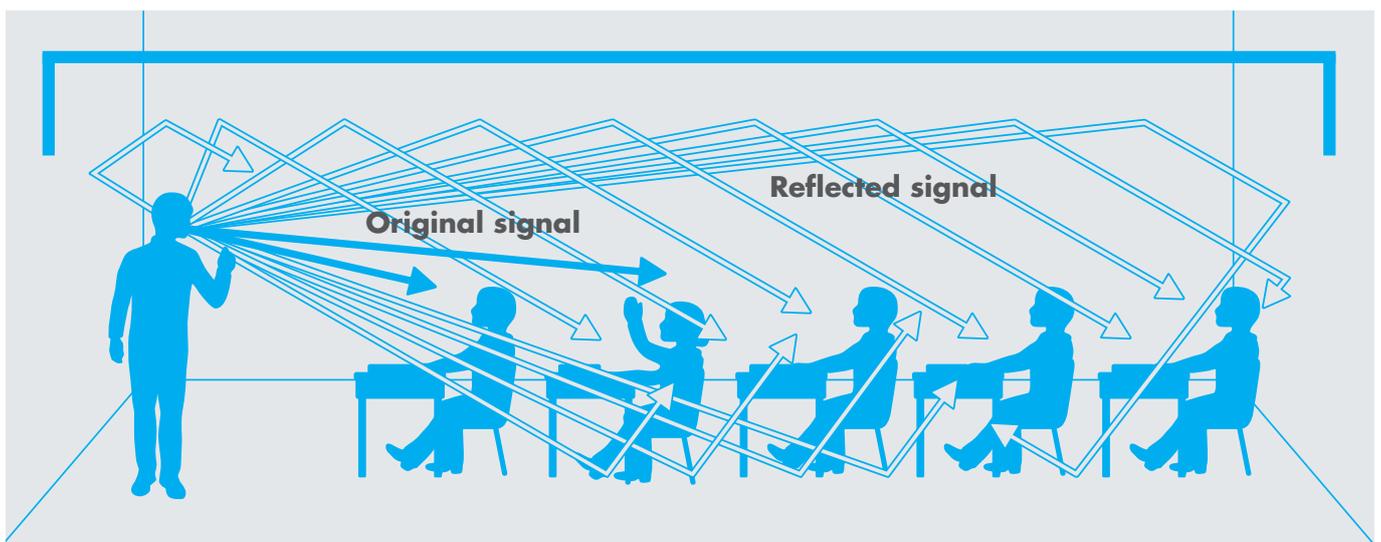
Where noise levels are high in a room (often where reverberation time is long), people raise their voice to be heard, which further worsens the situation. This is known as the Lombard effect, and is often seen in school settings such as dining rooms and assembly halls.<sup>3</sup>

The Lombard effect not only hinders the performance and behavior of the students, but has a negative effect on the teachers as well. Constantly having to raise their voices to be heard leads to headaches, sore throats, stress and fatigue.<sup>4</sup>

### Take control of acoustics

All materials have different acoustic properties. Gypsum, as well as being recognised as one of the most versatile building materials, is also recognised for its advantageous acoustic characteristics. It is ideal for use in acoustically sensitive environments. Depending on how the tiles are perforated, it can absorb, reflect and diffuse sound, giving you control over a room's acoustics. Gypsum also allows you to have a good listening and speaking environment.

*Did you know: acoustic ceilings can improve students' ability to identify words correctly by up to 35%<sup>5</sup>*



<sup>3</sup> 'Acoustics of Schools: a design guide', 2015 by the Association of Noise Consultants and the Institute of Acoustics

<sup>4</sup> Tiesler, T., & Oberdörster, O., "Noise - A stressor? Acoustic ergonomics of schools", Building Acoustics, 2008

<sup>5</sup> Source: How indoor climate affects productivity in offices, schools, and similar; Pawel Wargocki, DTU

Minimum performance standards for the acoustics of school buildings are set out in the government issued Building Bulletin 93 (BB93), stating that:

“The acoustic conditions and sound insulation of each room or other space must be suitable, have regard to the nature of the activities which normally take place therein.”

### ACOUSTIC RECOMMENDATIONS FOR VARIOUS EDUCATION ROOMS

Room type	Tmf seconds
Nursery, Primary or SEN classroom	≤ 0.6
Secondary School classroom	≤ 0.8
Open plan teaching area	≤ 0.5
Music Practice/group room, volume ≤ 30 m <sup>3</sup>	≤ 0.6
Lecture rooms (fewer than 50 people)	≤ 0.8
Teaching space intended specifically for students with special hearing or communication needs	T ≤ 0.4*
Assembly hall	0.8- 1.2
Indoor sports hall, swimming pool	≤ (1.5 - 2.0)**
Office, medical room, staff room, dining room	≤ 1.0

Adaptation of Table 6 Performance Standards for reverberation time, based on new buildings

\*averaged from 125 Hz to 4kHz octave band centre frequencies and T ≤ 0.6 s in every octave band in this range

\*\* dependant on size of space



Reflection and absorption is measured by the degree of sound absorption in a room. Knauf's product range covers a wide range of absorption classes according to the BS EN ISO 11654 enabling you to customise the acoustics of each room.

Acoustic gypsum from Knauf absorbs up to 90% of sound hitting its surface. It adheres to national acoustic requirements for specific reverberation times and can be tailored to fit the precise needs of different rooms, helping to create a quieter, calmer atmosphere.

## SOUND ABSORPTION CLASSIFICATION

SOUND ABSORPTION CLASS (BS EN ISO 11654)	SOUND ABSORPTION COEFFICIENT $\alpha_w$ (EN ISO 11654) WITH 200MM SUSPENSION AND 50MM MINERAL WOOL	ABSORPTION CLASS (VDI 3755/2015)	KNAUF PRODUCT
A	0.90 - 1.00	Extremely absorbing	Visona T Belgravia T and U3 Contur U3 Plaza T and U3 Corridor 400 T Tectopanel T Adit
B	0.80	Extremely absorbing	Contur T
C	0.60 - 0.75	Highly absorbing	Belgravia G, Q, M, U4 and U8   15   20 Contur G, Q, M, U4 and U8   15   20 Plaza G, Q, M, U4, U8   15   20 Corridor 400 G, Q, M Akustikpanel G1F, Q1F, Q2F, M1F, T3L2 Danopanel G, Q, M Contrapanel G Tectopanel G Solopanel
D	0.30 - 0.55	Absorbing	Akustikpanel G2F, M2F, T3L4 Stratopanel
E	0.15 - 0.25	Hardly absorbing	
Not classified	0.05 - 0.10	Reflecting	Danotile



## CASE STUDY

# SLÄTTÄNG SCHOOL, SWEDEN

“Before its renovation Slättängsskolan was a classic 70s-style school with a very limited inflow of light. Therefore, our goal was to create light and more up to date rooms in the school. For the same reason we also recommended a gypsum ceiling, because it provides a clean, light expression wherever it is used.

*“Our goal was to create light and more up to date rooms in the school”*

At the same time we established so-called “light islands” in the ceiling, partly aided by Knauf Stratopanel, which allowed us to give the light islands a beautiful, organic, amoeba-like shape. We had also worked together with Knauf before and were extremely happy with the collaboration.”

– Kerstin Wergeni-Wasberg  
Uulas Arkitekter

## KNAUF PRODUCTS USED

- Plaza Micro
- Stratopanel
- Belgravia Micro
- Akustikpanel on the walls
- Tectopanel on the walls

**Architect:**  
Uulas Architects, Kristianstad,  
Kerstin Wergeni-Wasberg



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# AIR QUALITY

Butzbach Schrenzer School, Germany, Plaza Globe  
Architect: Ludorf, Schön & Weissbrod Büro

# IMPROVING AIR QUALITY

Air quality is a particularly important issue for children because they have smaller lungs than adults and are more sensitive to pollution. In fact, exposure to pollution in childhood can cause long term harm.<sup>6</sup> This is why Knauf products are designed to not only protect the indoor climate, but to actively improve it.

As well as polluted air entering the building from outside, familiar indoor substances such as paint, cleaning products, perfumes and even electronic devices, all affect air quality. These potentially harmful emissions can include Volatile Organic Compounds (VOCs) that are linked to allergies, asthma and even cancer.

*Did you know: All of our perforated products come with the air cleaning Cleaneo Technology*

**CLENEO**  
TECHNOLOGY

## Dynamic air purification

All of our products contain our unique air purifying technology: Cleaneo Technology®. Cleaneo technology® improves the indoor air quality by reducing the concentration of polar volatile compounds like alcohol, aldehydes, ketones and esters – all typical emissions from everyday substances found in schools and colleges. Independent laboratory tests at the Fraunhofer Institute for Building Physics in Germany highlight the effectiveness of Cleaneo products.

In addition to contamination from substances used within the building, air quality can be impaired by materials used in the building itself. The Danish Indoor Climate Labelling (DIM) has rated Knauf products with a very low particle emissions rating (<0,75 mg) and an indoor climate value of 10 days.



<sup>6</sup> Beate Ritz, MD, Ph.D., Professor & Michelle Wilhelm, Ph.D, UCLA Institute of the Environment and Sustainability



Lycee Folereau a Belfort, France, Belgravia Quadril  
Architect: LORACH Thierry architecte

*Did you know: People spend 90% of their time indoors, and that Cleaneo Technology actively purifies the indoor air*

### **Resists heat and moisture**

The mould and other microorganisms that can grow in warm, moist conditions present a health risk, especially to people with existing health problems. Damp surfaces encourage the growth of mould, so they need to be minimised wherever possible.

All Knauf ceilings are suitable for use in 'normal' environments (up to 70% relative humidity at 25°C) and a number of our advanced solutions, such as Belgravia, Plaza, Akustikpanel and Danotile, have also been tested at 90% RH at 30°C. This makes them ideal for use in all environments found in typical educational establishments, including kitchens, laboratories and other rooms with frequent and extreme changes in temperature and humidity.



## CASE STUDY

# ST RICHARD REYNOLDS SCHOOL, ENGLAND

A range of acoustic ceiling products from Knauf were used to control noise in classrooms, corridors, halls and kitchens of the St Richard Reynolds Catholic College in Twickenham.

Faced with the twin challenge of meeting the requirements of BB93 and supporting an aesthetically pleasing design, architects DHP worked with Knauf to select a range of ceiling products combining appearance and performance.

Knauf's Belgravia Micro product provided the aesthetically pleasing acoustic solution: the plasterboard product incorporates perforations (in a range of sizes and styles) and is backed with acoustic felt, providing effective control of reverberations. This board integrates with Belgravia Plain and Plaza Plain to provide a continuous aesthetic appearance across the whole ceiling system.

## KNAUF PRODUCTS USED

- Belgravia Micro
- Plaza

**Architects:**  
DHP



## PROTECTING AGAINST FIRE



A fire in a school or college can develop very quickly and have devastating consequences. Besides the immeasurable human cost, a fire can cause a disproportionate amount of economic damage. As well as buildings, educational establishments often contain costly equipment and valuable resources.

Fire prevention is therefore imperative when building or renovating an educational facility. So when planning, designing, and choosing material for educational buildings, it is essential to consider fire safety and compliance with fire regulations.

Knauf can support educational schemes by providing guidance on choosing the right products and systems against regulatory and standard requirements. To ensure, Knauf products are tested in accordance with EN 13501 for fire classification.

The reaction to fire for products can be seen below:

- Danotile B-s1, d0
- Corridor 400 A2-s1, d0
- Contur A2-s1, d0
- Plaza A2-s1, d0
- Belgravia A2-s1, d0
- Akustikpanel A2-s1, d0
- Contrapanel B-s1, d0
- Solopanel A2-s1, d0
- Drypanel A2-s1, d0
- Tectopanel A2-s1, d0

Lycee Folereau a Belfort, France, Belgravia Quadril  
Architect: LORACH Thierry architecte

## BUILT TO LAST



Knauf products are exceptionally robust and durable. With the correct installation and maintenance, the product properties are preserved and there is no decomposition over time. This makes them ideal for the renovation, adaption and extension that is common in educational facilities.

Knauf ceiling products are tested in accordance with EN 14190, to ensure strong, high performing ceilings.

Plaza A+ Unity 3 and Contrapanel have been tested for additional impact resistance, making them the ideal choice for sports halls and gymnasiums. For other board types and more information please consult with the Knauf Technical Team.

Butzbach Schrenzer School, Germany, Contrapanel Globe  
Architect: Ludorf, Schön & Weissbrod Büro

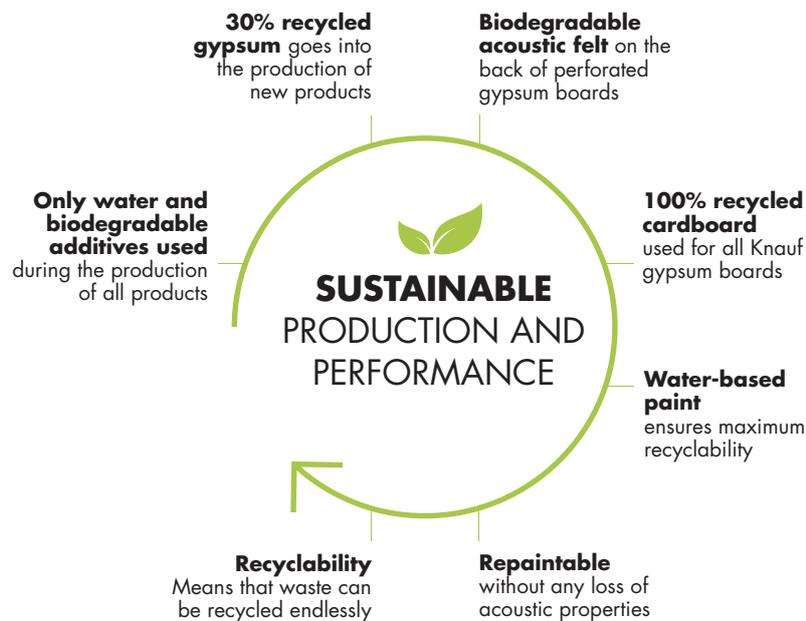
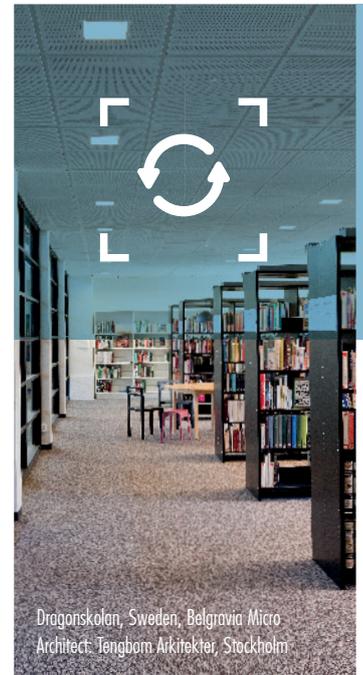
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# ENVIRONMENT

# SUSTAINABLE SOLUTIONS

Knauf products' properties have long lasting durability. They retain the same strength, the same acoustic characteristics and the same fire resistance. Light reflection is only affected in very dusty environments, and even then it is simple to vacuum clean the surface to remove the dust, or at worst, apply a fresh coat of paint.

At the end of their lifespan, our products are wholly recyclable. The crystalline agent which binds the gypsum together can be heated up. When this happens, the gypsum board turns back into a reactive powder. This is combined with waste gypsum powder created as a by-product of the cleaning process at power stations, to create new gypsum. So only a limited percentage of the gypsum in our products comes from virgin natural sources. The cardboard is also designed to be recycled.



## KNAUF: KIND TO THE ENVIRONMENT

- Long lifetime
- Recyclable
- Re-usable
- Re-paintable

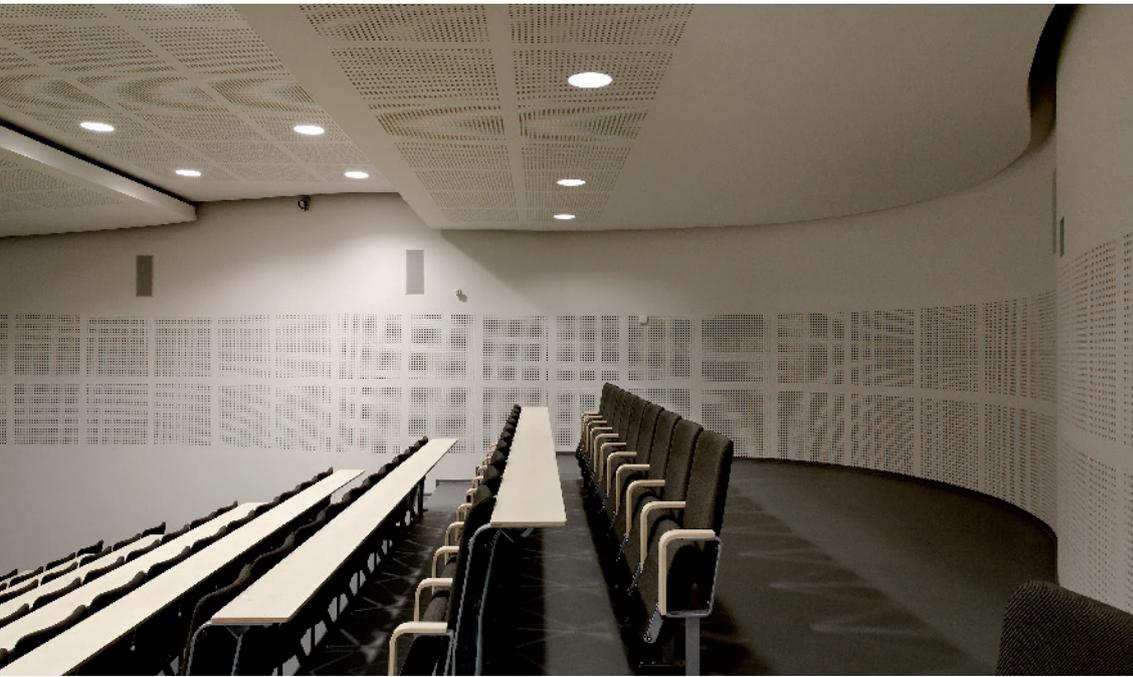
Find all our certifications and more at [www.knauf.co.uk](http://www.knauf.co.uk)

## EPD verified

All Knauf products come with an a third party Environmental Product Declaration (EPD®). This is a verified document that reports each product's environmental data, based on life cycle assessment (LCA) and other relevant information, in accordance with ISO 14025 (Type III Environmental Declarations).

An EPD must abide by the requirements and guidelines set out in ISO 14020 (Environmental labels and declarations - General principles). Any environmental claims based on the EPD should meet the requirements in ISO 14021 (Environmental labels and declarations – Self-declared environmental claims), as well as any national legislation and best practices in the markets in which it will be used.





## CASE STUDY

# VORDINGBORG BARRACKS

Vordingborg Barracks training centre is responsible for planning the training of soldiers to be sent out on peace-keeping missions. "The building is now turned into training rooms consisting of an auditorium for 220 people, two large classrooms that can be partitioned by folding walls, two smaller classrooms, and administrations offices," Chief architect Kim Bjørn explains.

The ceiling in the auditorium is made of free-hanging sheets overlapping each other. The sheets are equipped with sound absorbing gypsum boards, as well as sound and lighting systems. Also the curved walls are lined with sound absorbing gypsum boards. In other words, the curved organic shape is a key element in the architectural vision.

*"The curves are repeated in the vestibule that divides the auditorium and the classrooms"*

Chief architect Kim Bjørn: "The ceiling in the vestibule is a curved ceiling with lighting and ventilation system built in. The walls of the classrooms consist of untreated and smooth brickwork. The ceilings on the other hand, consist of sound absorbing gypsum boards."

## KNAUF PRODUCTS USED

– Akustikpanel

### Architects:

Kim Bjørn Arkitekter A/S



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# OVERVIEW



# ABOUT US

For more information, contact our ceilings specialist

## JAN WOLDANOWSKI

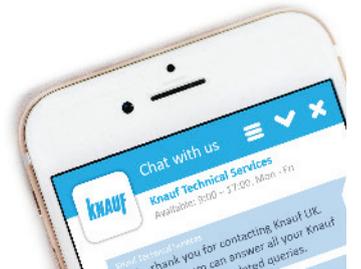
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## OUR TECHNICAL ADVISORS ARE HERE TO HELP

For any questions you may have visit [www.knauf.com](http://www.knauf.com) and use our Technical Services Webchat Open from 9:00 until 17:00 every weekday (except public holidays), our Technical Support Officers are ready to advise.

## Technical Services Live Webchat



## KNAUF SHOWROOM

Location:

20 Baltic St E, London EC1Y 0UL

Opening times:

Monday - Friday 9.30am - 5.30pm

Did you know:

You can now take a virtual tour of our Clerkenwell showroom by scanning the QR code and following the link:



Knauf Clerkenwell is a destination for inspiration, learning and collaborative working with the Architect & Design community.

Visit the showroom to discover the possibilities of Knauf products and systems which can influence your projects.

Come and speak to one of our Project Specification Managers who can help with technical advice and design as well as providing a quick specification service.

# SMART SOLUTIONS FOR SCHOOLS

Knauf gypsum-based acoustic ceiling and wall materials enable architects, designers and contractors to create educational environments that improve learning ability, as well as enhancing teacher and student well-being – and lowering the total cost of ownership.

## Acoustics

- Proven to absorb up to 90% of the sound that hits their surface.
- Adhere to national acoustic requirements for specific reverberation times.
- Can be tailored to fit the precise needs of different rooms.

## Ease of cleaning

- Very low attraction to dust particles.
- Tougher stains can be removed using standard cleaning practices.

## Air pressure, air purification and air quality

- Unique Cleaneo Technology® reduces the concentration of VOCs like alcohol, aldehydes, ketones and esters.

## Durability and maintenance

- Can be re-painted, cleaned and maintained without adversely affecting the acoustic, fireproof or indoor climate properties.

## Moisture resistance

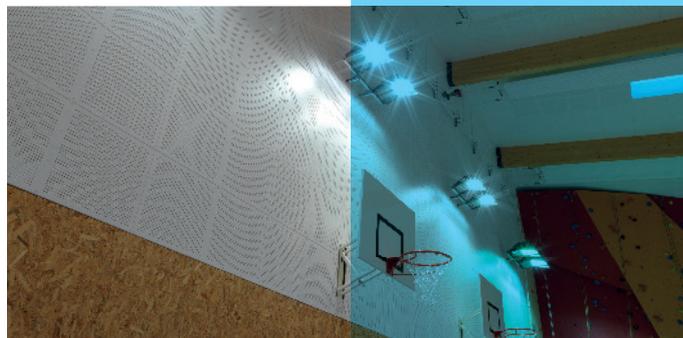
- Suitable for the majority of rooms - able to withstand up to 70% relative humidity at 25°C.
- Advanced solutions ideal for more extreme conditions, such as kitchens, laboratories and basements.

## Minimising particle emissions

- Very low particle emissions.
- Classified to ISO Class 5 in accordance with ISO 14644-1.



C.E.T.E. Lyon, France, Visona Tangent  
Architect: Linda Aydostian



Lons-Le-Saunier High School, France, Contrapanel Globe  
Architect: Serge Roux Architecte

#### **Access for service and maintenance**

- Easy to mount and de-mount.
- Easy access to the void for service and maintenance tasks.

#### **Robustness**

- Exceptionally robust with excellent pressure resistance.
- No decomposition over time.
- Contrapanel is tested in accordance with EN 13964 – the toughest requirements for impact resistance.

#### **Fire Safety**

- Tested according to EN 13501-1 standards.

#### **Load-bearing capacity**

- Can bear five times their own weight.
- Some products can bear up to 3kg direct weight without extra support.

#### **Environment**

- Long-lasting durability.
- EPD verified.
- Consistent appearance.
- Excellent light reflection.
- Wholly recyclable.

# PRODUCT GUIDE

	CONTUR	BELGRAVIA	PLAZA	CORRIDOR 400	AKUSTIKPANEL	TECTOPANEL	CONTRAPANEL
<b>ACOUSTICS</b>							
NRC Rating	Up to 0.90	Up to 0.90	Up to 0.90	Up to 0.95	Up to 0.75	Up to 0.85	Up to 0.70
$\alpha_w$	Up to 0.95	Up to 0.95	Up to 0.95	Up to 0.95	Up to 0.70	Up to 0.90	Up to 0.65
EN 11654	Class A - C	Class C - D	Class A - C	Class C			
<b>HYGIENE</b>							
DIM indoor label	Best class						
VOC Emission	Class A+						
<b>SURFACE CLEANING</b>							
Moisture Resistance	70% RH and 25°C	90% RH and 30°C					
Cleaning	Damp cloth Vacuum cleaner						
<b>AIR PURIFICATION</b>							
Up to 70% reduction of formaldehyde <sup>1)</sup>	✓	✓	✓	✓	✓	✓	✓
<b>LIGHT REFLECTION</b>							
% Reflectance	From 69.2% to 82,6%	From 69.2% to 82.6%	From 69.2% to 82.6%	From 70.9% to 82.6%	Dependent on paint used	Dependent on paint used	From 74.1% to 86.3%
<b>REACTION TO FIRE</b>							
EN 13501 labelling	A2-s1 ,d0	B-s1 ,d0					
<b>SUSTAINABILITY</b>							
LEED/BREEAM credit opportunity	✓	✓	✓	✓	✓	✓	✓
EPD <sup>2)</sup>	✓	✓	✓	✓	✓	✓	✓

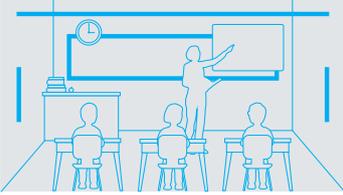
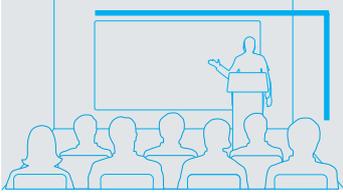
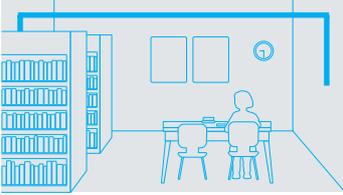
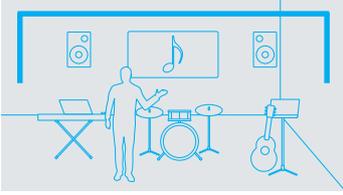
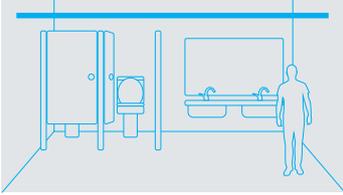
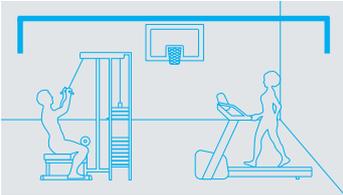
<sup>1)</sup> Also heavily reduces a number of other toxic and non toxic VOC's.

<sup>2)</sup> EPD = Environment Product Declaration.

# ROOM BY ROOM GUIDE FOR LEARNING SPACES

## Simply the right solution

Creating a healthy and safe learning environment is a matter of uniting acoustic comfort, fresh air and visual coherence. It's that simple – with the right solution.

ROOM FOR...	RECOMMENDED PRODUCTS	ACOUSTIC COMFORT	SERVICE LIFE	AMOUNT & PLACEMENT OF ACOUSTIC MATERIALS
 <p><b>Interaction</b></p> <p>Learning environment for children and students; workplace for teachers; Interaction (i.e. Classroom, special education, open space)</p>	Plaza, Belgravia	Speech comfort (speak without straining the voice cords) Listening comfort (hear clear speech and rethorics) Optimise daylight (with light diffusing material) Improve air quality by diffusing ventilation	Robust, longlasting material Repaint without acoustic loss Easy access to installations	100% ceiling surface Recommended rev. time: 0.6-0.8 sec.
 <p><b>Lectures</b></p> <p>Learning environment for students. Work environment for teachers. One-way communication (i.e. Auditoriums)</p>	Akusikpanel, Tectopanel	Speech comfort (speak without straining the voice cords) Listening comfort (hear clear speech and rethorics) Improve air quality by diffusing ventilation	Robust, longlasting material Repaint without acoustic loss Easy access to installations	80-90% ceiling surface Acoustic materials placed away from speaker Recommended rev. time: 0.8-1 sec.
 <p><b>Concentration</b></p> <p>Group work. Study environment. Privacy. (i.e. Group work rooms, meeting rooms, open space, libraries)</p>	Plaza, Belgravia	Privacy (undisturbed interaction, comfort) Reduced noise Optimise daylight (with light diffusing material) Improve air quality by diffusing ventilation	Robust, longlasting material Repaint without acoustic loss Easy access to installations	100% ceiling surface Recommended rev. time: 0.4-0.6 sec.
 <p><b>Activity</b></p> <p>Learning environment for students, work environment for teachers. Teaching &amp; learning through activity / by doing (i.e. music, workshop, lab)</p>	Contur, Belgravia, Plaza	Reduce noise Sound reduction between rooms Optimise daylight (with light diffusing material) Improve air quality by diffusing ventilation	Robust, longlasting material Repaint without acoustic loss Easy access to installations	100% ceiling surface Recommended rev. time: 0.6-0.8 sec.
 <p><b>Service</b></p> <p>Working environment for service staff. Hygiene regulation (i.e. bathrooms, kitchen)</p>	Danotile	Absorb low frequency sounds	Robust, longlasting material Repaint without acoustic loss Easy access to installations Minimise dust deposits (use dust-repellent ceiling surface)	100% ceiling surface Recommended rev. time: 0.8-1 sec.
 <p><b>Sports</b></p> <p>Bright and comfortable surroundings for sports and games. (i.e. gym hall)</p>	Contrapanel	Reduced noise Impact resistant material	Robust, longlasting material Cleaning	100% ceiling surface Recommended rev. time: 1.5-2.0 sec.



**Customer Service**  
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