KNAUF

SPECIFYING
KEY ISSUES
REQUIREMENTS
SOLUTIONS

IN FOCUS

EDUCATION

CONTENTS

AN INTRO TO KNAUF

With more than 150 facilities, 70 quarrying operations and 23,000 employees in over 40 countries, family-owned Knauf is one of the leading plasterboard manufacturers in the world. Knauf produces more than 1 billion square metres of plasterboard each year.

An international provider of lightweight construction systems, Knauf's diverse range of products includes plasterboard, mineral fibre tiles, acoustic boards and tiles, internal and external cement boards, dry and wet floor screeds and glass and mineral wool insulation.

Founded in 1932, the company has not only manufactured plasterboard for over 80 years – meeting some of the most stringent sustainability and manufacturing regulations worldwide – but its engineering department is recognised as one of the world's leading plant designing teams.

In Australia, Knauf is proud to operate two manufacturing facilities, employ over 220 employees and manage a national franchise, the PlastaMasta network. Products sold to the local market are overwhelmingly Australian-manufactured.

Education leader

Knauf's experience can be demonstrated through some of the numerous major projects it has worked on across Australia including Northern Beaches Christian School (NSW), Kings School (Sydney), Australian National University Medical School (ACT), Ormond College (VIC), to name just a few.

Expert engineers

Knauf has its own team of expert engineers who can add significant value and financial savings, when they are engaged in the early stage of design.

When designing a new educational institution – Knauf engineers work with the architect to create an acoustic zoning plan. This includes planning of 'quiet' and 'noisy' spaces, separating them wherever possible by distance, and creating external areas or neutral 'buffer' spaces.

"Knauf is driven by a determination to produce innovative products and systems that are exceptionally engineered to meet the requirements of the Australian education sector"

The effect of environment on productivity

> Outside views improve mental function and memory by 10-25%
> Daylight improve students test score achievements by 5-14%
> Daylight creates a 20-26% faster learning of students.

Source: Business Case For Green Building Report IEQ Productivity and health, June 2013.

“The acoustics that this ceiling gives are absolutely brilliant”

Jeanette Harkness,
Head of Library services, Roseville Girls College

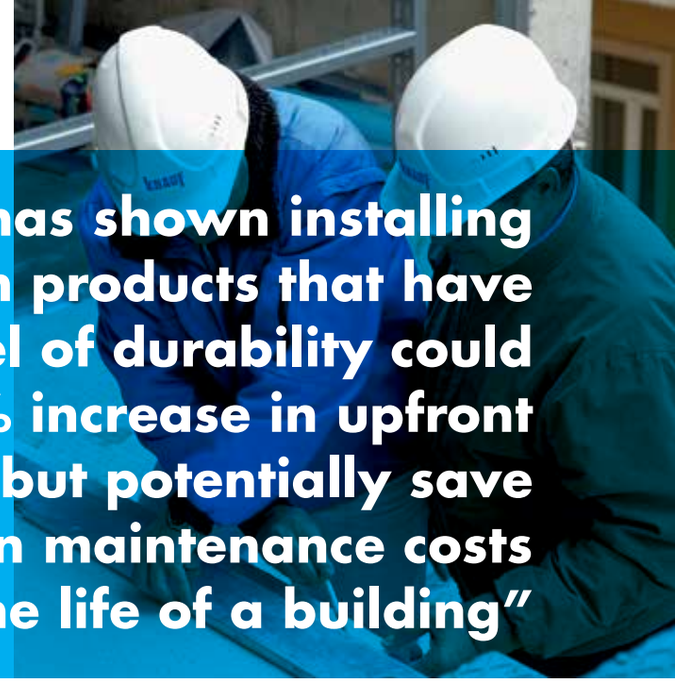
“We achieved a higher acoustic performance per square metre”

Paul Gallagher,
Director, Studio GA

> **PROJECT:** Roseville Girls College Library refurbishment and extension, Sydney, designed by Paul Gallagher, Studio GA. This $4.3m project was completed in October 2012.

> **KEY FACTS:** When specifying the celling linings for Roseville Girls College’s new library, the architects were met with a significant acoustic challenge due to the ceiling’s 46 service panels. Through the use of Cleaneo the architect was able to increase the amount of perforated ceiling by 60 percent.

KEY TO SPECIFYING



"Experience has shown installing a wall with products that have a high level of durability could mean a 10% increase in upfront material costs but potentially save 20% or more in maintenance costs throughout the life of a building"

Building design and sustainability are two of the key issues facing designers, builders and manufacturers in the Australian education sector.

The continued development of world-class education facilities throughout Australia presents a number of key challenges to stakeholders. New needs have emerged which centre on area-specific performance, ease of construction and stringent safety and sustainability requirements. Knauf is catering to them all.

Building design enhancing performance

One of the major issues facing educational planners and architects, as well as parents and students, is the crucial part played by building design on the performance, motivation and behavior of students.

Acoustics, physical environment and security all help to create the key components of an educational building. A high standard of building design is the cornerstone from which schools can start to fulfill these objectives and Knauf has developed a variety of design solutions to make this a reality. These take into account the needs for design creativity, building adaptability,safety requirements and sustainability.

Sustainability

Knauf provides a wide range of products, systems and services that meet the Australian education sector's stringent environmental standards.

Knauf's approach to sustainability for building projects focuses on the following: the manufacture of best-practice sustainable products through a process operating under rigorous environmental guidelines, and an onsite 'dematerialisation' process.

Plasterboard is inherently sustainable, being 100% recyclable with low embodied energy and made largely from a naturally occurring mineral – gypsum. Knauf sources its gypsum from large natural reserves within Australia and uses recycled gypsum, while the liner paper used to make plasterboard is biodegradable and made from 100% recycled paper.

Knauf products can also significantly contribute to a project's Green Star rating, a system created by the Green Building Council of Australia (GBCA) to evaluate the environmental design and construction of buildings.

Plasterboard used in the construction of a sustainable building can contribute points towards the overall Green Star rating by meeting requirements in Materials, Indoor Environment Quality and Management categories. A range of Knauf's products are independently certified by Green Tag.

Another of Knauf's key sustainability solutions focuses on reducing the amount of product on site, a process called dematerialising, which can potentially reduce the total amount of material on a project by 30 to 40%.

Dematerialisation, maintenance and safety

The availability of multi-function lining solutions is drastically changing the Australian education sector landscape, by improving overall construction speeds, efficiency and cost.

In the past, those catering to the Australian education sector had to work with a plethora of lining products that required complex design and logistics considerations, and development costs. They may have had more than a hundred wall types catering to different requirements such as acoustic performances, fire ratings and water resistance.

Today builders and contractors have access to a range of advanced multi-function lining products, as well as value engineering experts who can recommend the ideal lining solutions for any education specification. In fact, with Knauf's new streamlined solutions, designers, builders and contractors don't have to work with over 100 wall type products – they can do it with less than 10.

As well as being an integral part of the dematerialisation process, multi-function linings increase a facility's safety and surety as they make it more difficult for incorrect linings to be applied during construction and repairs. It also means that when using products such as QuadShield every single wall has sound insulation properties, as well as impact, water and fire resistance, adding an extra level of functionality across the building.

Installing a wall with highly durable products can present significant dollar savings, a 10% increase in upfront costs could potentially save 20% or more in maintenance costs throughout the life of a building.

EDUCATION: KEY ISSUES & REQUIREMENTS

Education environments including childcare centres, schools, TAFEs and universities present specific design challenges in the areas of acoustic characteristics, fire performance and material durability, particularly as all are subject to intense use throughout their life.

Knauf has developed a simple range of proven systems to meet all these criteria whilst offering a host of advantages over more traditional school building methods. The Knauf Plasterboard specification team has a wealth of experience in value engineering, specifying and supporting major education projects.

KEY AREAS OF CONSIDERATION FOR EDUCATION ARE:

> **ACOUSTICS** There are multiple acoustic requirements within an institute of learning. These include sound insulation (airborne and impact), acoustic noise absorption and diffusion. Different spaces also have different acoustic requirements, for example libraries versus canteens.

> **AIR QUALITY** To ensure students are alert and in the ideal environment for learning, good air quality in classrooms is vital. It is also a priority in densely populated spaces such as auditoriums, to ensure the air is clean and in canteens, to dissipate strong odors.

> **AESTHETICS** Places of education must look appealing, inviting and conducive to learning.

> **STRENGTH AND ROBUSTNESS** Schools and universities are subject to extremely robust treatment from their students and, as with any large building, a key design objective is to minimise maintenance cycles and expenditure. It is essential therefore to construct schools to withstand potentially high levels of use and impact whilst also maintaining their aesthetic and performance criteria.

> **SHELF LOADING** Walls within educational institutions need to be able to accommodate a variety of fixings from light (whiteboards and mirrors) to heavy (shelving and large wall cupboards).

> **SAFETY** Including fire resistance is important in all environments and of course student and staff safety is critical within the education sector.

> **WATER RESISTANCE** Wet areas including toilets, showers, and kitchens require low maintenance water resistant solutions to reduce moisture damage and mould growth.

> **HEALTH AND HYGIENE** Robust internal surfaces and finishes are essential to maintaining hygiene and reducing infection in educational facilities. Areas of particular concern include gyms, canteens, science rooms and wet areas.

> **SECURITY** Safeguarding documents and equipment in staff rooms, and protection of external walls from accidental damage or vandalism and intruder penetration, is a consideration.

> **MAINTENANCE** Ongoing costs relating to the maintenance of the building, including its ability to uphold performance requirements and building integrity, are important upfront considerations. Knauf products and systems are robust providing increased durability however if the requirement occurs are easy to replace.

> **SERVICE PENETRATIONS** Installation of services including metal pipes, UPVC pipes and electric cables all need to be considered, without negatively impacting acoustic and fire ratings.

Exposed challenges: concealed solution

Working to tight budget constraints, a brief for modern aesthetics, and stringent acoustic requirements, the designers of Ballarat University’s new Science and Engineering building found a solution in Knauf’s Heradesign lining.

Project architect Tanja Klocker from SKM-S2F Architects says zoning the building for a range of different functionalities while balancing cost considerations, acoustic requirements and aesthetic appeal, presented a number of challenges for her team.

“Most of the money going into the new building was going towards equipment,” Klocker says. “So there was a lot of pressure on us to specify a durable, functional and cost effective material while still addressing the innovation of the building.”

Klocker explains while discipline-specific ceilings were required in some parts of the facility, the project’s cost consultants wanted to keep much of the ceiling exposed, which if left untreated could severely impair the building’s acoustics.

“It was certainly an acoustic challenge,” she says. “Even though the cost consultants wanted the ‘exposed ceiling’ aesthetics, we had to give it some acoustic treatment – so we fixed the Heradesign Panel over the concrete.”

Klocker says her team specified Heradesign because of the need for strong acoustic properties, however aesthetics and cost also played an important factor.

“We were able to make the most of Heradesign’s beautiful texture as well as keep the cost consultants happy,” she says.

Knauf worked closely with SKM-S2F Architects throughout the specification and installation project to ensure the building’s aesthetics were achieved to level the designers had envisioned.

“At one point during installation when we had to ensure all the edges of the panels were painted, we had a quick response from Knauf helping us to get the look we wanted.”

> **PROJECT:** Ballarat University, Victoria, designed by SKM-S2F Architects.

> **KEY FACTS:** The project value was $43 million and completed in February 2013. The use of Heradesign contributed to the facility’s modern aesthetics while improving its acoustic performance and fitting within Ballarat University’s budget.

HIGH IMPACT AREAS

By their very nature, schools are subject to extreme wear and tear. Thousand of students and teachers will pass through school corridors every year and hundreds of thousands of hands will lean on walls over their life span.

High impact areas in educational institutions include corridors and halls, gyms and external walls. Due to the number of people passing through them these walls must be resilient to a large amount of impact. Other key considerations for these areas include acoustics, aesthetics, security and fire protection.

> IMPACT RESISTANCE

Educational buildings are particularly sensitive to damage and numerous areas in educational buildings are required to be sufficiently robust.

Walls in high impact areas simply must perform - they must be durable and impact resistant. How durable and impact resistant will depend on how much traffic is expected in the region and what kind of impact: soft body impact includes students and teachers passing through the halls and hard body impact includes equipment such as bags hitting corridors and bats and balls banging against gym walls.

Schools can be subject to accidental damage and unfortunately also deliberate damage.

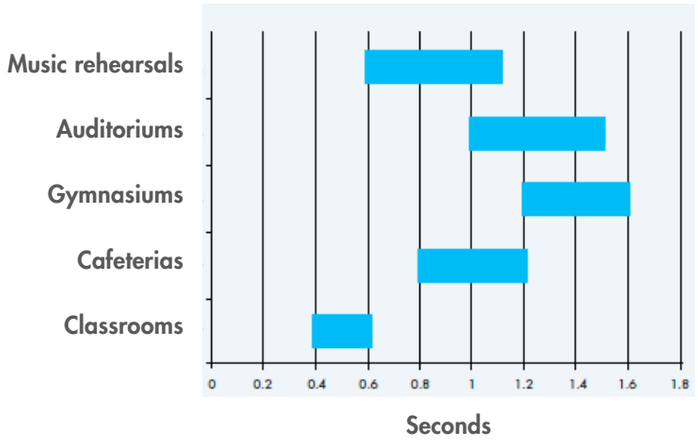
Impact damage can add significantly to maintenance costs over the lifetime of an educational facility. Knauf provides robust wall constructions that withstand virtually all types of traffic. The scratch and abrasion resistance provides a significant advantage ensuring the buildings overall appearance and aesthetics are maintained. In practice, this means long-life, low maintenance walls that delay the need for renovation and offer favourable operating costs over the long term.

WALL GRADES BY CATEGORIES OF DUTY

GRADE	CATEGORY OF DUTY	EXAMPLES
Light Duty (LD)	Adjacent space only accessible to persons with high incentive to exercise care. Small chance of accident occurring or of misuse.	Staff accommodation
Medium Duty (MD)	Adjacent space moderately used primarily by persons with some incentive to exercise care. Some chance of accident occurring and of misuse.	Head teacher's office
Heavy Duty (HD)	Adjacent space frequently used by the public and others with little incentive to exercise care. Chances of accident occurring and of misuse.	Classrooms
Severe Duty (SD)	Adjacent space intensively used by the public and others with little incentive to exercise care. Prone to abnormally rough use and vandalism.	Corridors, stairwells and toilets

HIGH IMPACT AREAS

SUITABLE REVERBERATION TIMES



Source: www.reverberationstime.com, www.acoustics.com

> **ACOUSTICS** Areas with open spaces and large amount of traffic have a unique set of acoustic requirements. In large areas with many occupants, such as halls and gyms, there are often many people talking at once. It is important to work out the right acoustic approach between sound reflection, diffusion and absorbtion, to make sure that, voices can be heard where desired and sound is reduced where it is necessary.

> **REVERBERATION** Within a room reverberation is caused by sound bouncing off hard floor, ceiling and wall surfaces. In order to control reverberation, these surfaces need to be covered with sound absorbing materials.

> **AESTHETICS** Aesthetics of the internal and external walls play a major part in the overall look of an educational facility. The look of it should be inviting and welcoming and create a sense of pride in the pupils, parents and teachers.

Ceiling aesthetics must be considered particularly in areas with large open spaces, such as gyms. Feature areas within these spaces help to ensure they are aesthetically pleasing; good ceilings open up a space and poor ceilings hem it in.

> **SECURITY** Security is vital, particularly for areas such as external walls that can be a point of penetration and target for vandals. Knauf has lightweight, easy to install walls that are strong and provide the perfect alternative to traditional masonry walls. They are also washable, incase they are subject to vandalism. Specialised Knauf products can also be used to minimise build time whilst providing a superb durable finish.

> **FIRE RESISTANCE** In case of fire, every second counts. Staff and students need to get out as quickly as possible for safety, and fire teams need to be able to access and isolate fire-affected areas.

Plasterboard has inherent fire resistant qualities, as 25% of the weight of gypsum is crystalline water. During a fire this is released in the form of steam.

In the past only specific areas of buildings would be built with fire-resistant walls. However now with Knauf specialty solutions such as QuadShield it is possible for every single wall to be fire resistant – an important safety advantage particularly in areas such as schools with large amounts of people.

LESSONS AND LEARNING

The majority of lessons and learning take place in classrooms and lecture theatres. Acoustics in the form of speech intelligibility, combined with aesthetics and air quality, are essential requirements in order to create an indoor climate that is conducive to learning.

> **AESTHETICS**
Classrooms and lecture theatres must be designed in a way that is inviting, appealing and conducive to learning. Schools built in the past can often have a focus on practical designs neglecting aesthetics – yet more and more architects are proving it doesn't have to be that way.

Elements with greater visual impact not only make a space more attractive but also promote the learning process. No matter whether round, curved or formed with special edges, Knauf has endless design options for light weight construction to enable greater aesthetic appeal. School auditoriums and university lecture theatres are large spaces. These are the spaces in which ceilings can impress, with features like atriums. Ceilings also need to be tailored to their space: classrooms stimulating while not distracting, staffrooms professional and libraries comforting and calming.

TRADITIONAL PRODUCTS

MASTASHIELD
SOUNDSHIELD
DESIGNPANEL
MINERAL FIBRE TILE AND GRID

SPECIALTY PRODUCTS

QUADSHIELD
SONAROCK
CLEANEO
HERADESIGN
DANOLINE
KINOPANEL
AMF THERMATEX ACOUSTIC
AMF THERMATEX ACOUSTIC DB
AMF THERMATEX ALPHA

Acoustics

Speech intelligibility is most important to classrooms where learning takes place; a teacher's voice must travel uniformly and consistently. Good classroom acoustics improve learning, student behaviour and conditions for teachers' wellbeing. Inversely, poor acoustics can be detrimental to student learning and teachers' health and as studies have shown can even lead to an increase in headaches, sore throats and sick days. [Source AMF Education, 2006- 2007]

Teacher or lecturer effectiveness in delivering the message is all too often compromised by even modest levels of noise intruding from adjacent areas, and sound reverberation generated within the room. Exposure to noise has an immediate effect on the mental state of both pupils and teachers. Consequences can include poor speech comprehension, reduced attention and concentration and greater psychological instability. [Source AMF Education, 2006- 2007]

Teachers should not need to raise their voice to be heard nor should outside noise penetrate the classroom and interfere or disrupt teaching.

The main acoustic criteria that educational institutions need to address are:

> Airborne sound insulation between spaces
> Impact sound insulation between corridors or stairwells and other spaces
> Reverberation time in teaching and study spaces
> Sound absorption in corridors, entrance halls and stairwells
> Speech intelligibility in classrooms and in particular in open plan learning spaces
> Sound reflection around and sound projection from the lecturer.

> **SOUND INSULATION AND RW RATINGS** Sound within classrooms must be restricted from transferring to other rooms and disturbing students. In any room, the loudness of the noise source and the room conditions dictate the acoustic impact. Good audibility in a room describes conditions that ensure transmission from an acoustic source to a listener.

Rw is a laboratory-measured value that applies to walls, ceiling/floors, ceiling/roofs, doors or windows. The higher the number, the greater the sound insulating power of the building element.

When selecting the required level of airborne sound insulation between two rooms always use the highest Rw value. Rw ratings in education institutions vary from low ratings of around 35 up to high ratings between 62 and 67.

RW 35 for areas with no specific acoustic requirements such as storerooms.

RW 50 for areas with medium levels of acoustic requirements such as classrooms.

RW 67 for areas with high activity noise and low tolerance such as drama rooms, music studios and auditoriums.

> **ACOUSTIC ABSORPTION** Good acoustic absorption within the room helps stop or reduce the energy of any sound 'bouncing around' within a room and also leaving a room to the outside. Using the proper type of absorption reduces disturbing echoes and improves audibility. Not enough absorption leaves too much disturbing noise and too much noise reduction can lead to a dead room, where all noise is absorbed by all surfaces, so there is no reflection of sound. Each room has its own optimum acoustic absorption level.

> **ACOUSTIC ABSORBENT MATERIALS** including people and materials within the room – can dampen noise levels and reduce reverberation times. Sound absorption materials can therefore help ensure there is a noticeably quieter environment within a space. As a result, the use of suspended ceilings and wall surfaces to control room reverberation times can be very important. Perforated, porous and open cell materials can all achieve high sound absorption values and in so doing improve audibility within a room.

CEILING ATTENUATION CLASS(CAC) Ceiling Attenuation Class (CAC) is a measure for ceiling systems displaying resistance to sound passing up and over a wall; it is the most common measure of acoustic insulation.

The acoustic rating given for the ceiling system indicates the sound reduction from one room to the next via the two ceilings and the above ceiling plenum.

CAC >35 Typical general performance acoustic zones: For areas where sound transfer through the ceiling is not a major concern such as canteen areas.

CAC 35-40 Typical general performance acoustic zones: For areas where sound transfer through the ceiling is of general concern and needs to be controlled such as class rooms.

CAC >40 Typical general performance acoustic zones: For areas where sound transfer through the ceiling is a major concern and needs to be controlled such as library and study rooms.

Knauf has a comprehensive range of ceiling and wall systems to meet acoustic requirements for sound insulation, reverberation time and indoor ambient noise levels.

NORTHERN BEACHES CHRISTIAN SCHOOL – REFURBISHMENT OF STATE-OF-THE-ART LEARNING SPACE

“Being a large space that’s interconnected meant the ceiling had to work really hard.”

Catherine Downie,
Project Architect at BVN Donovan Hill Architecture

> **PROJECT:** Northern Beaches Christian School refurbishment of state-of-the-art learning space, The Zone, designed by Catherine Downie, BVN Donovan Hill Architecture. The $250,000 project was completed in January 2011.

> **KEY FACTS:** Acoustic performance played a key role in the success of the Northern Beaches Christian School’s innovative learning space.

“The key to this space working so well is the last thing you notice... the acoustic panels”

Anne Knock,
Director of Development, Northern Beaches Christian School

The centerpiece for the School’s progressive learning environment, The Zone, is an adaptive, open learning space for more than 180 students. Through the use of Cleaneo panels on ceiling – the architect was able to overcome a significant acoustic challenge, and attenuate an energetic and boisterous environment.

TRADITIONAL PRODUCTS

MASTASHIELD
SOUNDSHIELD
DESIGNPANEL
MINERAL FIBRE TILE AND GRID

SPECIALTY PRODUCTS

CLEANEO
HERADESIGN
DANOLINE
KINOPANEL
QUADSHIELD
SONAROCK
AMF THERMATEX ACOUSTIC
AMF THERMATEX ALPHA

SPECIALTY ROOMS

Within a school there are many areas that have a unique set of requirements. These rooms include libraries and music rooms where acoustics and aesthetics are key. Also important, particularly to libraries, is shelf-loading.

Libraries

These key learning spaces must achieve a balance of functionality, aesthetics and acoustics, with their main purpose being a quiet area of study.

Most important to libraries is insulation to prevent outside noise from entering. Acoustics must also prevent the reverberation and reflection of voices within, minimising the noise coming from the whispers of multiple voices at work. Finally, libraries must be warm and inviting yet clean and functional.

Libraries have a low activity tolerance and a low noise tolerance, with their upper limit for indoor ambient noise level 35 dB*.

Music rooms

The design and finish of music rooms should be balanced to enhance the acoustics, it is necessary for an acoustic technician to be involved in the design of these rooms.

Music rooms must have good acoustics to improve the sound within and create an environment for optimum sound production. Another key aspect of the acoustic requirements is to prevent sound from transmitting through the wall into other rooms and disturbing other students.

Music rooms have a very high activity tolerance and low noise tolerance; their upper limit for indoor ambient noise level is 30 dB*. They require specific acoustical design to provide an environment that enhances the music and gives feedback to the musicians. The room should not be too hard, which creates echoes, or too soft, which dulls the music.

Requirements for music rooms should be considered early in the design stage by the project acoustician, as they can require very specific detailing for sound reduction and sound absorption. The Knauf Plasterboard Specification team can assist in this task and offers an extensive range of solutions for sound absorption.

>**SHELF LOADING** Important right throughout schools from everyday classrooms to specialty rooms such as libraries is shelf loading. School and university walls need to support a range of attachments, from mirrors in bathrooms and whiteboards in classrooms to shelves of heavy books in libraries. Knauf has numerous solutions and mounting systems for this purpose, allowing load-bearing walls to perform within permissible levels of safety and serviceability.

**Refer to table 1 of AAAC guideline for educational facilities acoustics*

HEALTH, HYGIENE AND WET AREAS

Health and hygiene are of course important right throughout schools and educational institutions. However where there are a lot of people, particularly children, there are also a lot of germs. When it comes to health and hygiene, critical issues in education include wet areas, water resistance, mould and mildew, air quality and bacteria.

> WET AREAS

Particular caution always needs to be taken in wet areas. In educational facilities, these areas include canteens and kitchens, bathrooms and change rooms, and science rooms.

Knauf provides specialised products to fit wet area applications. The resistance of these specialty products to water ensures that walls stay in excellent condition, preventing mould growth and ensuring areas remain hygienically clean.

Every educational facility includes a variety of wet zones, from those with moderate exposure to splashing water, like staff room kitchens and canteens, to those constantly exposed to water, such as showers in change rooms.

> WATER RESISTANCE

Why is water resistance so important? Damaged or sagging wall linings, mould and mildew, flaking paint and detached 'waterproof' tiling can all occur without the right protection. Without the right type of base material providing protection from long-term exposure to water, moisture build-up or water spills can drastically affect the appearance of wet areas. Cost of rectification in these areas can be in the tens of thousands of dollars, not to mention the inconvenience of closing areas whilst they are being repaired. A small upfront cost penalty in these areas is well worth the investment.

> MOULD AND MILDEW

On any surface with a food source or level of moisture, mould and mildew will grow. This is an issue particularly in the northern states, where humid environments and excess air moisture increase the likelihood that mould and mildew will grow. This can happen during or post construction.

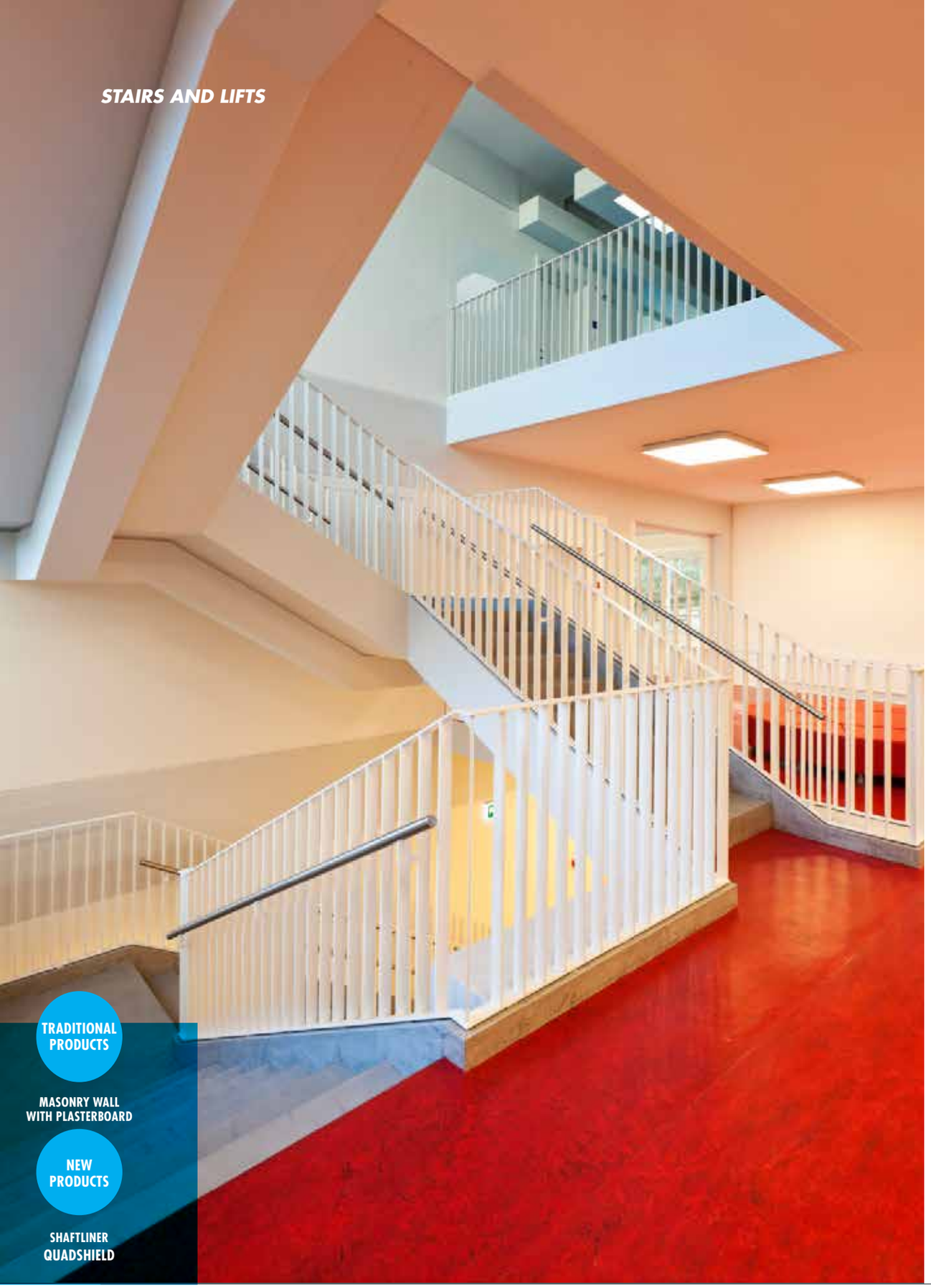
Growth of bacteria can happen readily in 'wet areas' so an essential requirement is that linings can easily be wiped down in order to prevent its growth. Knauf has a variety of options available to address bacteria growth, from water resistant boards to mould and mildew resistant additives.

> AIR QUALITY

There's no question that the quality of the air we breathe has a profound impact on our health and wellbeing. Increasingly, the quality of our indoor air (at home, work, school and leisure) is being assessed and improved. However, it's also being potentially compromised, as buildings are made more airtight in the pursuit of energy efficiency.

When it comes to improving indoor air quality, the most efficient method is to control the main sources of VOCs (Volitile Organic Compounds) like furniture, paints, floor coverings, cleaning agents, glues and other products. Ventilation is another key element having a large impact on air quality.

However, Knauf provides yet another option with its product Cleaneo, a lining with its own air purification technology.



STAIRS AND LIFTS

Stairs within educational institutions need to address key criteria including impact and deflection, strength and fire protection.

> IMPACT AND DEFLECTION

Impact and deflection resistance of stair walls is of particular concern when there are tens of pairs of feet on a stairwell at one time, during breaks when students are rushing to their next class.

> STRENGTH

Stair walls must be strong, and the higher they are the more strength they need. As stair height increases the forces of nature begin to dominate the structural system and take on greater importance in the overall building system.

> FIRE-RESISTANCE

Shaft wall systems are fire-rated, non-load bearing walls used for lift shafts, service ducts, stairwells and fire-isolated passageways.

Walls that enclose lift-shafts, stairwells and other vertical shafts are the most important walls in a building from a life-safety standpoint. Should a fire occur, fire services use the lifts to reach the fire. The stairwells provide the only means for people to exit the building. Since these walls contain the lifelines of the building, they must be structurally strong enought to withstand lateral loads and fire-resistant.

In the past, schools, universities, TAFEs and child-care centres have generally been designed with compartmentalised fire areas; only specific areas of the building had fire-resistant walls. Should a fire occur, the aim was that it could be compartmentalised into a particular area. Fire officials then concentrated on managing and evacuating that area. Now, with Knauf solutions, all areas can be fire-resistent.

MAINTENANCE

In order to preserve the integrity of a building, ongoing maintenance is a key consideration for educational institutions, from both a cost and performance perspective.

Knauf's high quality products and solutions reduce the effects of damage, wear and tear and therefore overall maintenance and its associated costs.

Ceilings need to be accessible for maintenance or services without the need to remove an entire tile system. Knauf offers a range of ceiling solutions, each allowing easy access to services while also maintaining a ceiling's aesthetics.

SERVICE PENETRATIONS

Service penetrations may seem like a small factor in the large world of educational buildings, but this small factor can have a large impact.

Every wall in a school, TAFE or university may connect a number of services through its walls: water pipes, gas pipes, electricity or cables. And whenever a service runs through a wall there is a risk of compromised wall performance – a simple hole in a wall can reduce water and fire resistance, as well as acoustics.

The treatment of service penetrations is therefore a significant factor in wall performance for which Knauf has a number of solutions.

Minimum impact

By re-specifying with Knauf's SONAROCK during a refurbishment of Camberwell Boys Grammar – the design team slashed the amount of material by a third while reducing the need for ongoing maintenance.

Project architect Robert Tadesco explains he switched the specification to SONAROCK during an advanced project stage after recognising an ongoing cost saving for the client, and witnessing superior impact and acoustic performance.

"We were already moving into the construction phase with another product when we decided to go with SONAROCK," he says. "Not only could we recognise a cost saving and a way to reduce ongoing maintenance, but the board had better impact and acoustic performance."

For Tadesco, ongoing maintenance was a key consideration for the project. He explains a number of standard plasterboard walls throughout the school were being repaired or completely replaced on a regular basis.

"Repairs come at quite a considerable cost so even when it's just a few instances they really add up," He says. "Once we explained this, the school's property manager also saw the benefit of running with a sturdier product."

SONAROCK helped to consolidate and reduce the amount of material needed for the project by as much as a third, according to Tadesco.

"On previous jobs we have had two, three, or even four types of plasterboard," he says. "But with SONAROCK we were able to consolidate that down to one."

Tadesco adds his team established a good rapport with Mark Micallef, National Project Manager at Knauf who helped to alleviate concerns the contractor had about working with a new product at a late project stage.

"With Mark's help, we were able to put the contractor in direct contact with Knauf to sort questions he had about working with SONAROCK," he says. "Mark also took us to see a number of projects currently under construction using SONAROCK, which I found invaluable to establishing the quality of the product."

> **PROJECT:** Camberwell Grammar refurbishment, designed by Robert Tadesco, Peter Crone Architecture. Lining installations by McCorkell Constructions.

> **KEY FACTS:** The project value was $20 million and completed in December 2012. Through the use of Knauf's SONAROCK, the architects were able to consolidate the specified materials from three down to one.

PRODUCTS

WALLS

TRADITIONAL

MastaShield

ImpactShield

WaterShield

SoundShield

FireShield

Masonry walls with plasterboard

Designpanel

SPECIALTY

QuadShield

SONAROCK

PERMAROCK®

Knauf security walls

Cleaneo

Heradesign

Contrapanel

Kinopanel

CEILINGS

TRADITIONAL

SpanGrid Protech

SpanGrid Cleancare

Mineral Fibre Acoustic Tiles

Designpanel

SPECIALTY

Cleaneo

Corridor 400

Contrapanel

Heradesign

AMF THERMATEX Acoustic

THERMATEX Acoustic dB

THERMATEX Alpha One

THERMATEX Aquatec

Hygena

PERMAROCK®

STAIRS AND LIFTS

TRADITIONAL

Masonry

NEW

ShaftLiner

WALLS

TRADITIONAL PRODUCTS

MASTASHIELD
IMAPACTSHIELD
WATERSHIELD
SOUNDSHIELD
FIRESHIELD
MASONRY WALLS
WITH PLASTERBOARD
DESIGNPANEL

SPECIALTY PRODUCTS

QUADSHIELD
SONAROCK
PERMAROCK
KNAUF SECURITY WALLS
CLEANEO
HERADESIGN
CONTRAPANEL
KINOPANEL
CORRIDOR 400

Traditional

MastaShield is standard plasterboard for internal wall and ceiling linings. It suits a wide range of applications within education buildings and is economical, lightweight and available in a range of sizes including long sheets to minimise joints.

ImpactShield is high-density plasterboard reinforced with fiberglass mesh to provide extreme impact resistance from both hard and soft knocks and bumps. It is an impact resistant plasterboard designed to meet the needs of high impact areas including halls and corridors. It is also fire resistant and can substitute 13mm FireShield in any fire rated system.

WaterShield is water resistant plasterboard suitable for use in internal wet areas and as a substrate for tiles.

SoundShield is plasterboard with a high-density core providing excellent sound insulation to create quiet study areas throughout schools and universities. As it has superior sound resistance and reduces noise transfer between rooms, it is ideal for wall and ceiling systems in libraries, classrooms and staffrooms.

FireShield is a fire resistant plasterboard with good acoustic performance for internal lining applications where a Fire Resistance Level (FRL) is required.

Masonry wall lining Knauf has developed a number of plasterboard lining solutions for use in conjunction with masonry walls where security, impact, fire or acoustics is of concern. These systems are available in the Knauf Technical Manual.

Designpanel is a precision engineered plasterboard that provides high acoustic performance and great design. Designpanel controls reverberation time through a combination of sound absorption and diffusion, providing enhanced acoustic comfort and a high quality sound experience. Available in four styles Designpanel is ideal for a range of applications where controlling the sound reverberation time is required including large open areas such as lecture theatres and auditoriums as well as classrooms, libraries and staffrooms. Certified by Global GreenTag to Green Rate Level A, Designpanel contains from 85% to 95% recycled content (post industrial 78-83%, post consumer 7-12%).

Specialty

QuadShield is the ideal all-in-one plasterboard solution for all walls in schools, universities and TAFEs. QuadShield is a 4-in-1 Global GreenTag Level A plasterboard incorporating impact, water and fire resistance, and its high-density core provides excellent sound insulation properties.

Apart from the obvious benefits of ensuring every wall is both fire and water resistant, QuadShield helps to simplify installation, reducing the amount of products required onsite. It also simplifies the maintenance process as it limits the chance of an incorrect product being used and reduces maintenance costs due to its high durability.

QuadShield can support loads of up to 25 kg directly off the board using a strap-toggle, without the need for costly noggins or framing behind the wall in non-firerated applications. When combined with Knauf Hartmut cavity dowels, this load-bearing strength can be increased to over 35 kg.

QuadShield is manufactured with water-resistant additives, which reduce the absorption of water and offer protection against the growth of mould and mildew. Additional treatments are available which significantly improve this performance.

QuadShield is ideal for use right throughout educational institutions.

SONAROCK is high-density gypsum fibreboard wall lining, manufactured from a mix of natural gypsum and recycled materials including cellulose fibre from recycled paper. It is even higher density and stronger than both SoundShield and QuadShield, offering acoustic resistance that's the highest in its class. It provides extremely high hard body impact and gouge resistance, and creates durable walls requiring low maintenance. SONAROCK is the best choice in situations where acoustics are the highest priority. It is suited to wet area installations and its fire resistance meets Building Code of Australia requirements.

PERMAROCK is a solid, engineered wall lining made from inorganic aggregated cement embedded with coated glass fibre mesh. It has a high dimensional stability when exposed to moisture or temperature variations, is highly resistant to impact and has good sound insulation. It has limited expansion or contraction when exposed to moisture, reducing the likelihood of cracked or de-bonding tiles. It has high dimensional stability when exposed to temperature and humidity variations and is 100% water resistant, so there is no swelling, disintegration or damage. It is the perfect choice for the buildings external walls with the benefit of having control joints only every 15m and wet areas including swimming pool and bathrooms.

Knauf security walls are an upgrade solution that will improve security for any wall system. The system uses a sheet metal barrier that is installed as part of the framing construction. The construction is cost-effective and the security wall upgrade may be applied to any Knauf single, staggered or double stud wall system without reducing fire and acoustic performance. Knauf security walls are ideal in staffrooms to protect teachers, equipment and confidential personal information.

Cleaneo is a unique acoustic gypsum wall and ceiling lining with built-in air purification that reduces both smells and airborne pollutants, such as volatile organic compounds (VOC), improving the overall air quality.

Cleaneo has a unique built-in air purification that removes odours and pollutants to improve the overall quality of indoor air making it ideal for use in high traffic areas including corridors, halls, lecture theatres, libraries, classrooms and school canteens. It is available in a range of aesthetic styles, and its continuous perforations create a seamless appearance. Its aesthetic options, combined with excellent acoustic absorptions, make it the ideal choice for use in large open areas including lecture theatres and auditoriums that have an acoustic and design requirement. Cleaneo is made from a mix of post industrial and post consumer recycled content as well as natural gypsum. Cleaneo is installed using Uniflott Jointing Compound.

Heradesign range is made from sustainable, PEFC-certified timber, pure magnesite and water. Heradesign wood wool lining is a natural performer with a range that has classic fibre surfaces and almost unlimited colours. Heradesign's unmatched design flexibility combined with its exceptional acoustic performance make it an ideal choice for libraries.

Knauf Danoline range of acoustic gypsum ceiling and wall materials was developed by Knauf to meet the most advanced European acoustic standards. Every panel and perforation is precisely engineered and manufactured to provide sharp square edges.

Knauf Danoline is suited to ceilings and walls where acoustics and aesthetics are critical, and is ideal for spaces including classrooms, libraries and auditoriums. The precision engineering, range of patterns and acoustic fleece combine to deliver both sound absorption and diffusion. The result is enhanced audibility and a high-quality sound experience. Danoline is also flame-resistant, climate regulating and emission-free.

Danoline linings use up to 10% pre-consumer waste from site returns, up to 12% post-consumer waste and up to 80% recycled flue gas desulphurization (FGD) gypsum. They are also Green Rate certified to level A for more Geen Star points.

Kinopanel is a specialised acoustic wall and ceiling lining. It is manufactured from high-grade non-combustible glass fibre reinforced gypsum. Kinopanel has a discreet unified look with elegant oval perforations; the colour of both the panel surface and the perforations can be tailored to individual requirements.

Kinopanel also has excellent sound diffusive properties preventing echoes and ensuring acoustic comfort. Its excellent acoustic properties regarding absorption and eliminating echoes makes it the ideal acoustic wall or ceiling lining for school concert halls and auditoriums.

Traditional

SpanShield is a10mm plasterboard for internal ceilings which is designed to span internal ceiling joists or furring channels up to 600mm without sagging.

Mineral Fibre Acoustic Tiles can be used as decorative ceiling tiles in areas where noise reduction by sound absorption or control of reverberation time is required, and where continued relative humidity is not more than 90%. They are available in white (like RAL 9010); in different surfaces and edge types. These high quality acoustic tiles can be installed in an exposed T-grid demountable suspended ceiling system and are well suited for use throughout schools and kindergartens.

Designpanel Designpanel is a precision engineered plasterboard that provides high acoustic performance and great design. Designpanel controls reverberation time through a combination of sound absorption and diffusion, providing enhanced acoustic comfort and a high quality sound experience. Available in four styles Designpanel is ideal for a range of applications where controlling the sound reverberation time is required including large open areas such as lecture theatres and auditoriums as well as classrooms, libraries and staffrooms. Certified by Global GreenTag to Green Rate Level A, Designpanel contains from 85% to 95% recycled content (post industrial 78-83%, post consumer 7-12%).

Specialty

Cleaneo is well suited to ceiling spaces that have an acoustic and aesthetic requirement, and where air purity is important as it has a unique built-in air purification.

Corridor 400 is a self-supporting acoustic gypsum ceiling with a span length of up to 2400mm. It has a distinct unified look and is ideal for narrow rooms and corridors. It provides easy access to installations, as it does not require suspension runners and hangers

Contrapanel is an acoustic ceiling lining with a distinct unified look. It meets the toughest requirements for impact resistance. It is the perfect solution for school and university gym ceilings as an acoustics and impact resistant solution. Its white, plastic covered surface also means it is easy to clean and offers good light reflecance thereby providing light, modern, attractive spaces for school sporting activities.

Heradesign has design flexibility and acoustic performance providing a modern natural look. It is well suited to both the walls and ceilings of auditoriums, lecture theatres and libraries as well as classrooms.

AMF THERMATEX Acoustic is a high performance acoustic tile. The special tile structure provides good sound absorption as well as excellent levels of sound attenuation. It is made from specially perforated mineral board and has an attractive acoustic fleece facing. The perforations provide excellent sound absorption while the fleece facing offers a smooth, elegant surface finish. It is ideal for areas where it is important to dampen the sound in the room and wher very short reverberation times are required.

AMF THERMATEX Acoustic dB is similar to THERMATEX Acoustic but with even greater levels of sound attenuation. These tiles are a higher density and come in both 24mm and 30mm thicknesses for increased acoustic resistance.

AMF THERMATEX Aquatec is ideal in rooms with permanently high humidity, such as bathrooms, pools and science rooms where special demands are placed on the ceiling in terms of humidity resistance. Due to its special composition, THERMATEX Aquatec resists humidity up to 100% RH. This means that it is dimensionally stable when exposed to high humidity and temperatures from 0° to 40°C. For thorough cleaning THERMATEX Aquatec can be washed. Aquatec tiles also have outstanding sound absorption providing an optimal solution for most hygiene applications.

Hygena for AMF THERMATEX products. Hygyena is a special additive and an anti-microbial treatment. It has been developed to prevent both the contamination and spread of fungi and bacteria, and the growth of mould and mildew. Perfect for use in science rooms and wet areas.

PERMAROCK as described above is also suited to ceilings in addition to walls. It is ideal for use in wet areas.

Traditional

Lift shafts must be resilient to duress, heavy loads and fire risk.

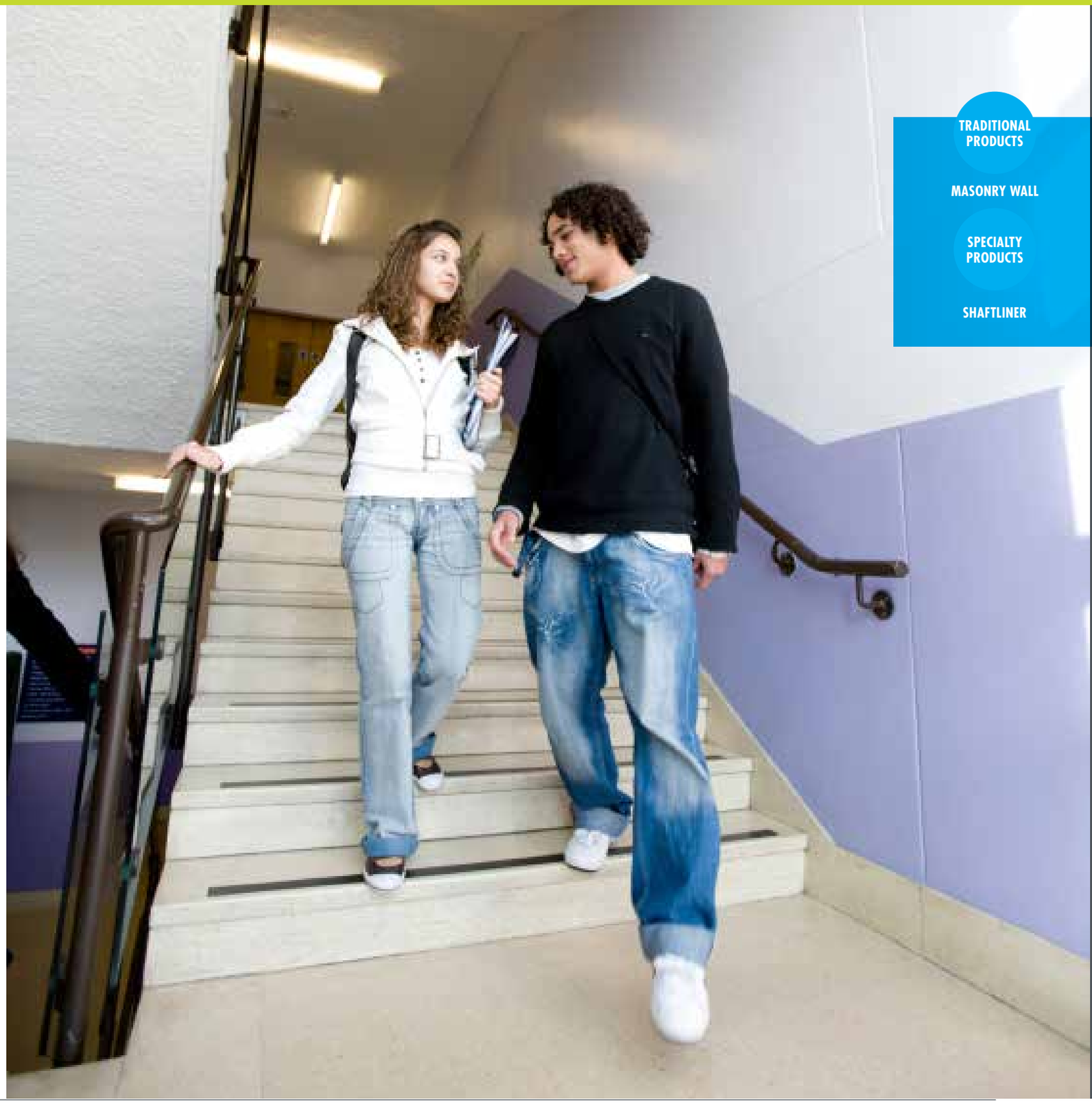
Plasterboard can be installed with masonry walls in traditional lift shaft construction. The masonry walls are made of brick or cement and then covered with plasterboard to increase their fire rating.

Specialty

The Knauf ShaftLiner system boasts several advantages compared to masonry construction.

ShaftLiner is 25mm fire resistant plasterboard. ShaftLiner is fire rated and used for non-load bearing walls in lift shafts, service ducts, stairwells and fire isolated passageways. ShaftLiner is ideal when constructing a wall where access is only possible from one side (this side is referred to as the storey side).

ShaftLiner compared to masonry construction:
> 75% lighter
> Thinner: typically less than 100mm wide using 64mm CH-Studs
> No wet trades required
> Faster installation – no scaffolding required inside the shaft



KEY SYSTEMS

PARTITION PERFORMANCE REQUIREMENT

AREA	ACOUSTIC RATING	FIRE RESISTANT	WATER RESISTANT	IMPACT RESISTANT	TRADITIONAL SYSTEM	SPECIALTY SYSTEM	ADVANTAGES OF SPECIALTY SYSTEM	ALTERNATIVE SPECIALTY SYSTEM WHEN SOUND INSULATION IS KEY
Corridors	Med			Yes	**KSW312(I)** ›1 x 13mm ImpactShield ›92mm Steel Stud ›50mm EarthWool 11kg ›1 x 13mm ImpactShield	**KSW610** ›1 x 13mm QuadShield ›92mm Steel Stud ›50mm EarthWool 11kg ›1 x 13mm QuadShield	Higher sound resistance, improved fire resistance (improving safety), added water resistance.	**KSW710** ›1 x 13mm SONAROCK ›92mm Steel Stud ›1 x 13mm SONAROCK
Classrooms	High				**KSW215** ›1 x 13mm SoundShield ›92mm Steel Stud ›50mm EarthWool 11kg ›1 x 13mm SoundShield	**KSW610** ›1 x 13mm QuadShield ›92mm Steel Stud ›50mm EarthWool 11kg ›1 x 13mm QuadShield	Much higher sound resistance, added impact resistance (reducing maintenance costs), added water resistance.	**KSW710** ›1 x 13mm SONAROCK ›92mm Steel Stud ›1 x 13mm SONAROCK
Staff rooms	Med				**KSW15** ›1 x 13mm MastaShield ›92mm Steel Stud ›50mm EarthWool 11kg ›1 x 13mm MastaShield	**KSW610** ›1 x 13mm QuadShield ›92mm Steel Stud ›50mm EarthWool 11kg ›1 x 13mm QuadShield	Much higher sound resistance, added impact resistance (reducing maintenance costs), added water resistance.	**KSW710** ›1 x 13mm SONAROCK ›92mm Steel Stud ›1 x 13mm SONAROCK
Wet areas	Med		Yes		**KSW312(W)** ›1 x 13mm WaterShield ›92mm Steel Stud ›50mm EarthWool 11kg ›1 x 13mm WaterShield	**KSW610** ›1 x 13mm QuadShield ›92mm Steel Stud ›50mm EarthWool 11kg ›1 x 13mm QuadShield	Much higher sound resistance, added fire resistance (improving safety).	**KSW710** ›1 x 13mm SONAROCK ›92mm Steel Stud ›1 x 13mm SONAROCK
Gymnasiums	Med			Yes	**KSW312(I)** ›1 x 13mm ImpactShield ›92mm Steel Stud ›50mm EarthWool 11kg ›1 x 13mm ImpactShield	**KSW610** ›1 x 13mm QuadShield › 92mm Steel Stud ›50mm EarthWool 11kg ›1 x 13mm QuadShield	Higher sound resistance, improved fire resistance (improving safety), added water resistance.	**KSW710** ›1 x 13mm SONAROCK ›92mm Steel Stud ›1 x 13mm SONAROCK
General purpose rooms	Med				**KSW15** ›1 x 13mm MastaShield ›92mm Steel Stud ›50mm EarthWool 11kg ›1 x 13mm MastaShield	**KSW610** ›1 x 13mm QuadShield ›92mm Steel Stud ›50mm EarthWool 11kg ›1 x 13mm QuadShield	Much higher sound resistance, added fire resistance (improving safety), added impact resistance (reducing maintenance costs), added water resistance.	**KSW710** ›1 x 13mm SONAROCK ›92mm Steel Stud ›1 x 13mm SONAROCK
					4 systems	1 system		1system

NEXT STEPS

The complete Plasterboard Technical Manual provides comprehensive information on our plasterboard products and systems, including non-sector specific details not included in this brochure. Additional product literature can be found on the web site. The manual should be used in conjunction with this brochure in the specification process. To access the manual, see **knaufplasterboard.com.au/technical-manual**

Knauf Plasterboard Pty Ltd
ABN 61 003 621 010
31 Military Road
Matraville NSW 2036
Customer Service: 1300 724 505
www.knaufplasterboard.com.au

Version 1 September 2013