SUSTAINABLE DESIGN:
BALANCING AESTHETIC INTEGRITY WITH ENVIRONMENTAL SENSITIVITY
An ever renewing source of collective passion, media promotion, economic persuasion, social compulsion and legal obligation fuels the drive towards sustainability. Together, these imperatives are underpinned by the most important of all: environmental necessity and impending energy scarcity.

Sustainability, as an ethos, is a reaction to basic facts. Sustainability as an objective can only be the product of action.

Buildings account for 40% of the world’s energy usage and offer a good place to start.

In the following paper we explore what defines a sustainable approach to construction; how it is envisaged, how it is enforced, and how it can be enacted.

The content will address the many considerations architects, specifiers, and contractors must make when pursuing the goal of sustainability throughout their projects — including construction, maintenance and refurbishment. Topics covered include; whole-life cycle costs, legislation, achieving user well-being and enhancing productivity while ensuring environmental performance.
ENERGY, EFFICIENCY, LONGEVITY, SUSTAINABILITY — THE WHOLE-LIFE CYCLE COST

Designers and contractors are faced with several challenges when working on individual building projects. Up-front costs are an obvious one. Whole-life cycle cost is something different.

As will be familiar to those working in today’s construction industry, whole-life cost, or life-cycle cost (LCC) refers to the total cost of ownership over the life of an asset.

Sometimes referred to as 'cradle to grave', these include the financial, environmental and social costs. The first is relatively simple to calculate, but the latter two can be difficult to quantify. Designers and contractors must be able to marry important intangibles with hard expenditure, while balancing planning, design and construction phases with maintenance, renewal and rehabilitation costs, amongst others. Expected energy usage — especially the thermal performance of a site — is one of the most important considerations.

Replacement and disposal are important factors as well, especially for a development aspiring towards sustainability: the lower the impact on the environment the better, and of course any opportunity to extend, or even re-use and renew the lifespan of products would make a welcome contribution to any LCC calculations and site waste management — as well as adding to a site’s total of BREEAM Ecopoints.

THE LAY OF THE LANDFILL

Landfill costs are increasing. The lower rate for passive waste may be £2.50 per tonne, but the standard rate for active waste currently stands at £64 per tonne and is scheduled to rise to at least £80 in 2014. Add to that the gate fees (a charge made by operators to dispose of materials to designated landfill sites) and costs as high as £120 per tonne for disposing of waste could occur.

That said, landfill still remains a relatively cheap method of waste disposal and is more popular with the public than incineration. Regardless of cost, though, waste going to landfill is of no practical value to the building industry. It certainly doesn’t generate revenue.

A combination of efforts towards sustainability (and good business sense) means that many contractors are now following ‘zero waste to landfill’ targets. By recycling or finding new uses for old materials, the construction industry can save money and the environment. By choosing materials that have long life spans and are easily reused, architects and specifiers can help to support these targets.

Product manufacturers also have a valuable role to play in creating products that can avoid landfill. Some have the ability to refashion, or ‘upcycle’ waste products to make them as good as new — the holy grail of sustainability. More on upcycling later.
Richard Francis, Chair of the British Council of Offices (BCO) Environmental Sustainability Group (ESG), believes that a comprehensive response is required to meet the environmental and sustainability challenges facing the office sector:

“What the industry needs most is to systematically incorporate feedback and learning into new projects. We can be highly imaginative and innovative in theory and design, but our understanding of actual outcomes and our implementation of improved processes lags behind other industries. Consequently, we invest a great deal of time and money at the front end without appreciating or understanding the consequences, and sometimes make the same mistakes long after we should have known better.

As an industry, we have a great understanding of potential but a poor understanding of performance — reinforced by regulation and market drivers that can reward appearance rather than reality. The financial and environmental price for this is high.

The biggest challenge is to find cost-effective, easily implemented solutions that will ease the burden on businesses and lead to actual reductions in impacts.”

Richard’s comments hold true for most developments, not just offices. It is no longer enough that a product is cost-effective and fit for immediate purpose — manufacturers must be able to prove its value and impact on the whole-life cycle of its intended project.
Renaissance of Renovation

According to the The Royal Institute of Chartered Surveyors (RICS), it is estimated that ‘11% of UK construction spending is on fit-outs and buildings may have 30–40 fit-outs during their lifecycle.’

With the global recession and the UK’s double dip slowing new builds, there has been a noticeable shift towards refit, refurbishment and repurposing.

By refurbishing and improving their current interior layouts, organisations can accommodate more users comfortably without having to move into larger premises. This helps keep costs down, increase operational flexibility and meet user expectations. Sustainability can also be improved. Landlords and tenants can refer to The Ska Rating environmental assessment plan, which is designed to enable them to ‘assess fit-out projects against a set of sustainability good-practice criteria’ as part of the UK Government’s Low Carbon Action Plan.

Renovation enables building owners to maintain the competitiveness of their asset in a tough economy. Refurbished spaces with lower energy costs will be more attractive to prospective buyers.

Richard Francis discusses the importance of perceiving buildings in terms of their total function:

“[The property industry needs] to focus more on what buildings do rather than what they are, particularly with regards to sustainability. Sustainability must be about achieving real results rather than cleverly meeting prescriptive requirements. This is not just in energy, water and waste, but in helping buildings achieve their mission — optimising the experience of occupants. Sustainable hospitals can and should heal people faster, sustainable schools should enable students to learn better and sustainable offices should enable healthy and productive workers.

We know our buildings can do more — and we need to realise the integrated benefits of buildings that help achieve purpose. We are beginning to see occupiers reward these buildings and I would like to see this trend accelerate.”

A renovation project presents a different set of challenges than a new-build — developers must be sensitive to the limitations of the existing building.

In most cases, efficiency is the driver for refurbishment: economic, operational and organisational.

Economic Efficiency
In a typical public building, more than half of the total energy use is attributed to lighting, heating and cooling. Making an old building more energy efficient will, therefore, reduce operating costs and offer a more comfortable climate — both of which are incentives for occupants.

Operational Efficiency
Many older spaces do not provide the level of HVAC (heating, ventilation and air conditioning), electrical and IT services required by today’s modern users. Moreover, some spaces were not designed for their modern use in the first place. For instance, old industrial buildings and heritage properties are often converted for new purposes. Meeting current acoustic, fire, safety and air quality regulations while respecting the original architecture can be a real headache for developers.

Organisational Efficiency
The way buildings are used evolves over time. To improve the value of their assets, property developers are keen to upgrade existing, out-dated, spaces into more commercially attractive open plan formats.

Flexible Designs Require Flexible Products
With the constant refit and maintenance that occurs in all heavily occupied buildings, it is important that they can withstand periodic reconfiguration as well as the wear and tear of daily use. Making smart material choices, including; durable, lightweight and easily demounted products allows interiors to keep up with the constant state of flux within.
As the focus on user well-being increases, more attention is being paid to the specifics of healthy indoor climates, including how to achieve them in an aesthetically pleasing manner.

For instance, hospitals and schools must be designed with particular concern for different sets of users, with consideration given to both operational functionality and health. While in the commercial sphere, company leaders wish to motivate their employees, but also want to provide them with the most appropriate working environment in which to succeed. As an organisation evolves, so too must its premises. It is reasonable to expect a typical site, one that is reactive to the needs of its users, will be changed several times during its lifetime. This is why environmental building schemes now require products that support a long-life time approach.

It is therefore important that the materials used within are easy to mount and demount to allow for relocation of walls and access to services. Flexibility is key; it facilitates clear communication and open plan interaction, quietness and privacy, expansion or contraction and any number of combinations as required. Choosing materials that fulfil multiple objectives beyond performance is also a sound strategy. For instance, highly reflective ceilings help to reduce lighting bills while improving the overall user environment. A win/win situation.

Of course, aside from user well-being, aesthetics are an important external indicator of the health of an organisation. For many organisations, particularly those in the service industry, their premises are the only tangible assets they can show to customers.

CREATE: HOW DO YOU ENSURE DESIGN INTEGRITY WHILE SATISFYING YOUR GREEN OBLIGATIONS?

The best buildings are those that are carefully designed to maximise health and a positive working environment, as well as productivity.
As awareness of building standards and rating systems such as BREEAM, Ska and the USA’s LEED have entered the mainstream, some developers and architects have been pushing green building beyond just energy performance. An increasing number of designers now look at the full environmental impact of a building over its entire lifecycle, and this includes the indoor environment.

Designers must be able to balance operational and energy efficiencies, with the effect on user well-being and productivity — and in the commercial sphere particularly, attraction and retention.

There are four main parameters of indoor environments — air quality, thermal quality, acoustics and lighting, which will be discussed in the following chapters. The effect of these parameters on building occupants can be broken down into three main families of effects: perception, physical symptoms and illness.

- **Perception** — how the person “feels” about the environment (is it too hot, too cold, too bright, too dark etc).
- **Physical symptoms** — these include dry eyes, runny noses and other minor ailments.
- **Illness** — at the far end of the spectrum, when a building can have a serious impact on its users’ health.

“People are less and less willing to tolerate a poor work environment,” states Geo Clausen, a leading international expert in the field of indoor air quality and associate professor at the International Centre for Indoor Environment and Energy (ICEE) at the Technical University of Denmark.

Studies have shown a 5–10% drop in performance in a poor indoor working environment. As a result, architects are and builders are starting to take note — creating a healthy indoor environment from the outset is now paramount.

So, what should building owners pay the most attention to? “First: building materials,” says Geo. “You don’t want to have indoor sources of pollution […] Next, you want to have sufficient ventilation and maintain a comfortable thermal environment.

“Then pay attention to acoustics. Not all materials that are good for controlling acoustics are good for the other parameters; you need to look at controlling acoustics with materials that don’t add to indoor pollution and that preserve the thermal environment.”
MATERIALS PERFORMANCE, SUSTAINABILITY AND WELL-BEING

If the indoor environment is paramount when striving for the optimum conditions for communication and productivity, then what are the individual factors that are required to achieve this ideal?

The following sections will discuss the importance of acoustics, thermal performance, humidity, emissions and light, and how they contribute towards a healthy, productive and sustainable working environment.

ACOUSTICS

“70% of people say that their productivity would be higher if their environment was less noisy.”

Julian Treasure
Sound Business, 2007

Studies show that acoustically-friendly spaces with comfortable lighting and optimum temperatures increase wellbeing, productivity and satisfaction. For companies, these universal benefits can also reduce absenteeism and staff turnover.

A COCKTAIL FOR A POOR ACOUSTIC ENVIRONMENT

Speech intelligibility is critical. In a room with several users it is important to keep the noise level as low as possible and to avoid a ‘cocktail-effect’, and stop the following chain of events:

1. High levels of sound or noise
2. Stress
3. Loss of concentration
4. General user well-being decreasing
5. Productivity/commercial viability suffering

Good sound absorption is required to create a quiet environment and adhere to the requirements of the UK’s Part E building regulations.

However, it is not always easy to balance the acoustic needs of a space with the heating, cooling and energy efficiency requirements.

Choosing the right materials from the beginning helps to create a good indoor climate; excellent acoustics, ventilation and materials that support the use of less energy all play a significant part in the building.

NEW DESIGNS, NEW ACOUSTIC CHALLENGES...

21st century architecture is characterised by an increased use of glass, expansive spaces, integrated lighting and monolithic ceilings.

For many building owners, modern, open interiors are integral to the communication of their brand values and an important way to attract users. However, the large windows and hard materials typically found in such buildings raise serious acoustic issues, while the growing use of thermal mass requires designers to rethink the way they design sound absorbing solutions, such as ceilings.

OPEN-PLAN — THE PROS AND CONS

PROS
• Communication
• Teamwork
• Lower costs
• More efficient

CONS
• Acoustic challenges
• Thermal issues
• Could have negative impact on user health
• Lack of privacy and confidentiality
• Require proper training to maximise gains in commercial sphere e.g. if higher ranking staff get private offices, younger employees lose access to expertise

“As the trend towards open plan offices and hot desking increases, 60% of people say that noise is the single most disturbing factor.”

Danish National Research Center for Working Environment:
“Noise from human activity”
BACK TO SCHOOL
The Department for Education has highlighted acoustic problems across a number of different types of school buildings. Old Victorian schools are found wanting for contemporary teaching methods, as are some modern constructions which do not always provide adequate sound insulation and may require special treatment. Multi-purpose rooms and open-plan layouts create obvious challenges — limiting excess noise is crucial to maintaining a healthy and productive environment.

TREATING HOSPITALS
Unsurprisingly, healthcare buildings have some of the most demanding regulations pertaining to safety, indoor quality and maintenance.

Just like in schools, a hospital consists of many different spaces, each with its own requirements. However, it is a necessity for all areas to reduce the risk of spreading infection. Appropriate building materials can contribute to this need.

Acoustics: Technical Design Manual 4032:0.3 (which replaces HTM 60 ceilings and HTM 08-01 acoustics) sets out requirements for use in healthcare applications, including hospitals, laboratories, health centres, doctor and dentist practices, and nursing homes:

Ideally, materials should not contain organic nutrients, be non-hygroscopic and avoid promoting the growth of microorganisms such as mould or bacteria.

In addition to hygiene, acoustics and fire safety are an important consideration. The right acoustic environment is paramount for a calm atmosphere which promotes speedy recuperation and patient rehabilitation. Sound absorbing materials improve ward acoustics and also help by reducing the sounds of voices, footsteps and trolleys on the typically hard wearing floor finishes found in the busy corridors and streets.

Good lighting conditions with the correct lux level and low glare, combined with as much natural light as possible is desirable for convalescence. To maximise lighting conditions, ceilings should have a light coloured matt surface with a diffuse light reflection exceeding 80%.

Poor acoustic conditions in the classroom increase the strain on teachers’ voices as most teachers find it difficult to cope with high noise levels. This often leads to voice problems due to prolonged use of the voice and the need to shout to keep control. Recent surveys in the UK and elsewhere indicate that teachers form a disproportionate percentage of voice clinic patients.

THE PSYCHOLOGY OF SOUND
Architectural psychologist Mille Sylvest, in cooperation with Roskilde University and 3XN’s Innovation Unit, GXN, is conducting PhD research into the relationship between architecture and social behaviour in office environments. According to Sylvest, noise isn’t just a disturbance that makes it difficult to concentrate: “A person’s well-being is closely linked to their level of satisfaction with their own status […] a noisy environment is a low-status one, which negatively affects personal well-being and changes a person’s behaviour. People shut themselves off from others in noisy environments. They become reclusive and withdrawn.” It appears therefore, that a lack of privacy and poor acoustics can impair the motivation for greater productivity and collaboration — the very goals that drive organisations to create open-plan environments in the first place.

SOUND SOLUTIONS
Knowing the impact of noise on the well-being of building users is encouraging designers and specifiers to work with acousticians on improving interiors.

Designing the buildings of tomorrow requires designing for human interaction, both physical and virtual, and supporting planned and unplanned encounters.

To achieve their requirements, acousticians are using all the tools at their disposal, including ceilings, islands, baffles and wall panels. They provide the flexibility required to tailor the acoustics of each space to the needs of the occupants.
THE SECRETS OF ROOM-TO-ROOM CONFIDENTIALITY

Much attention has been paid to reducing ambient noise levels within open-plan environments in order to improve user concentration.

But room-to-room confidentiality is an equally-important facet of acoustics.

In buildings, sound can transfer to adjacent spaces in various ways:

- **Direct sound**: through certain constructions such as a partition wall, or from the plenum through a suspended ceiling (1, 2 and 3). The latter case may involve equipment sound or the like;
- **Longitudinal sound**: sound that transfers via the suspended ceiling, into the plenum and then via the suspended ceiling of the adjacent space (4);
- **Impact sound**: this is sound that transfers to other spaces by direct contact with the construction, e.g. footsteps (5);
- **Flanking sound**: this is sound that transfers to other spaces via ‘short circuit’ routes such as poorly insulated floors, the adjoining corridor, common ceiling plenums, services, etc. (6).

1, 2 and 3 represent direct sound insulation. 4 represents longitudinal and flanking sound insulation. 5 represents impact sound. 6 represents flanking sound.
SOLUTIONS
There are two main ways of increasing confidentiality in a given space.

Insulation: High-insulating products can be used to prevent sound from leaking from one space to another. Full-height walls — from floor to plenum — are a very effective way to ensure great sound insulation, but a more flexible solution is to build the wall up to the suspended ceiling and use high-insulating ceilings, which can help achieve high levels of confidentiality and privacy. In extreme cases, these ceilings can also be combined with sound barriers installed directly above partition walls, which maintains the advantage of having such easily-movable walls.

Absorption: Applying acoustic treatments to the surfaces within a space will absorb sounds from people and equipment. Absorption reduces reverberation time, noise and sound pressure level in general. This creates a double effect since when the sound pressure level is low, people talk more quietly and their speech is intelligible. As a result less noise is transferred to the adjacent rooms. The two main contributors to sound absorption are high-quality acoustic ceilings and wall absorbers as they cover large surface areas of the space.

BETTER TOGETHER
Sound absorption and room-to-room insulation should not be thought of separately; there is a direct link between the two. Using a high-absorbing ceiling in the source room not only reduces the sound pressure in that room but also in any receiving rooms. That is why it’s important to select a product which combines the two.

The Danish acoustician Trøjgård Per Andersen points out that it is important to find the right combination of sound insulation and absorption. According to Andersen, many types of ceilings — such as plaster — insulate well, but they reverberate sound, leading to poor acoustics.

Trøjgård Per Andersen
Danish acoustician

“...It is therefore a challenge to find the combination that meets both conditions. It is about avoiding sound that becomes noise, with the result that we become irritated and stressed...”
THERMAL PERFORMANCE

THE CHALLENGE:

Some 40% of the EU and US’s energy consumption is attributed to buildings.

Most of this energy is used for heating, cooling or ventilation.

More than 50% extra CO₂ emissions from buildings are expected before 2030.

THE OPPORTUNITY:

75% of the energy consumption in buildings can be saved. This represents a 20% reduction in the world’s total energy need.

More than a million jobs can be created by making buildings more energy efficient and sustainable.

Energy efficiency can reduce the pressure on energy prices, worth billions of pounds.

Better insulation of buildings is a profitable way to reduce CO₂ emissions according to a study by McKinsey/Vattenfall; it is a low hanging fruit in combatting climate change. Millions of tonnes of CO₂ and fossil fuel can be saved by insulating our buildings.

This makes insulation a key climate technology. It can help reduce today’s unnecessary waste of fossil fuels from buildings and energy bills, not to mention contribute towards a high DEC rating for offices and other public buildings.

However, while thermal performance is a major factor in a holistic approach to sustainability, it must be properly integrated alongside other key concerns.

THERMAL MASS

Thermal mass is the ability of building material to absorb energy, store it and, at a later time, release it. Thermal mass can help reduce the cooling and heating demands of a building and make it more energy efficient.

THE TWO TYPES OF THERMAL MASS

Regular thermal mass: a thick concrete soffit is used to store thermal energy to heat and cool the building.

TABS (Thermo-Active Building System): a water-based surface heating and cooling system in which pipes are embedded in the concrete soffits of a building. This turns the soffits into giant heat exchangers.

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COOLING VERSUS ACOUSTICS

According to conventional wisdom, thermal mass and open spaces were thought to be incompatible. The problem was acoustics. Ceiling tiles are the main way designers ensure acoustic comfort in open spaces, but covering the soffit with a suspended ceiling prevents radiant heat and convection transfer between the room and the concrete soffit. As a result, designers have to make a tough choice: better cooling or better acoustics.

THINKING BEYOND THE CEILING

Research into TABS thermal mass construction has shown that it is possible to use suspended ceilings to control acoustics and preserve the performance of thermal mass. How? Simply by not covering the entire soffit.

Researchers conducted tests where they covered the soffit of a TABS building with varying percentages of mineral wool ceiling tiles. They also hung vertical baffles. They concluded that covering up to 50% of the ceiling area had no significant effect on the cooling capacity of the thermal mass. With 80% covered, the cooling coefficient was still around 70%. The baffles also had zero or barely any effect on cooling.

But what about acoustics? Not surprisingly, covering the soffit from wall to wall with ceiling tiles provided the best sound absorption. But 50–80% coverage performed nearly as well, especially when combined with wall panels. By combining ceiling tiles with other acoustics solutions, such as islands, baffles and wall panels, designers can provide an optimum level of acoustic comfort while letting the air flow freely in the room.
HUMIDITY

Excessive humidity and moisture in a building can promote the development of microorganisms such as mould and bacteria, which may cause allergic reactions, respiratory illness or skin problems.

Temperature changes cause humidity level changes. Air contains a certain amount of water vapour, which is expressed in % of relative humidity (RH). If the RH reaches 100%, the vapour will condense. In buildings under construction where the building materials have not dried out or are not hermetically sealed, moisture problems can occur. On a summer’s day, daytime temperatures can reach 30°C, whereas at night it can easily cool down to 17°C, increasing humidity levels and potentially causing condensation.

In wet rooms such as swimming pools and sanitary areas, and in kitchens, the humidity level is naturally very high, requiring special attention. Office environments do not typically experience these extremes; however, it is highly recommended to use non-hygroscopic materials wherever possible, to combat moisture and protect from spread of germs by providing no sustenance to harmful micro-organisms.

EMISSIONS

Most people spend up to 90% of their time indoors. Given this fact, it’s not surprising that the indoor environment is particularly important for our health.

Just as humidity presents its risks if not managed properly, emissions must be kept to within very strict limits — preferably zero. Professionals in the construction industry understand that building products should not emit odour, particles, carcinogens, or harmful levels of Volatile Organic Compounds (VOCs), such as formaldehyde.

Reducing the pollution load of indoor air is an effective way of improving the comfort, health and productivity of building occupants. Selecting products that have a proven low impact on air quality is essential, preferably those which have achieved an E1 rating in the European EN 13986 standard. Ideally, concentrations of VOCs and Formaldehyde should also remain well below acceptable levels even in fully furnished rooms with little fresh air.

LIGHT

Architects and health experts agree that light is important to personal well-being and performance.

Poor lighting can result in eye strain, fatigue and aching which in turn is likely to lead to deterioration in performance, particularly if work relies on visual equipment such as computer-based job roles (Parsons 2000, Nave 2004).

As this type of work is now common place, the importance of lighting for visual health and performance at work is likely to become increasingly important.

Although the quality of modern artificial lighting has improved, the most comfortable and economical source of light is still the sun. However, natural light is often insufficient on its own and must be combined with artificial light. As a result, not only the amount of light, but also the quality of light is important. Both need to be adapted to the users of a room.

After sunlight and artificial light comes indirect light, via reflection. High light reflection helps make effective use of available light. The light reflecting capacity of a ceiling, for instance, not only contributes to a reduction in electricity bills but also improves the quality of lighting conditions. As the ceiling is the only surface in a room that is completely visible, the light reflection should be as high as possible to make effective use of the light.

A ceiling with the right combination of high light reflection and good light diffusion leads to a uniform and accurate spread of light in a room, reducing the need for light fixtures. A higher light diffusion value leads to less dazzle and avoids mirror effects.
CREATE AND PROTECT

Rockfon acoustic ceiling and wall solutions are a fast and simple way to create beautiful, comfortable spaces for modern buildings and renovation projects.

Easy to install and durable, they protect people from noise and the spread of fire while making a constructive contribution towards a sustainable future.

This ensures that Rockfon’s ceiling solutions are among the highest performing, most cost effective and time efficient in today’s interiors market.

The comprehensive ceiling solution portfolio from Rockfon ensures that customers are able to add value to the construction process, by ultimately creating superior interior environments that also protect the external environment.

UPCYCLING

Landfill sites are a finite resource which are diminishing rapidly so it is far better to recycle products at the end of their useful life than to dispose of them.

But Rockfon does not just recycle — it upcycles. In traditional recycling, products made from recycled materials can be of lesser quality than products made from new materials. Rockfon processes waste products into new fibres having exactly the same qualities as those made from new or virgin materials.

This offers hope for achieving the biggest goal of environmentally minded design: reusing materials again and again to keep them out of landfills.

Rockfon stone wool products contain up to 84% recycled and renewable content and can be fully recycled at a local Rockwool/Rockfon production facility at the end of their life cycle.

With a patented recycling process, Rockfon turns waste materials into new stone wool insulation products with precisely the same qualities as if virgin materials had been used. The Rockwool/Rockfon production process enables precise control of the fibres, ensuring that the stone wool can be classified as biosoluble.

When choosing Rockfon products for a refurbishment project, Rockfon can also recycle any age and any quantity of end of life wet felt mineral fibre ceiling tiles into high quality stone wool.

This latest initiative from Rockfon also supports wholeheartedly the Ceilings Sustainability Partnership’s REAP guidelines to reduce waste and find alternative use, thereby reducing the environmental impact of the ceiling industry.

Rockwool and Rockfon factories receive 500,000 tonnes of waste materials from other industries annually — six times more waste than Rockwool/Rockfon send to landfill. The up-cycling of Rockfon products can take place at any Rockwool factory with a briquet plant and occurs at the plant closest to the point of collection, minimising the need for unnecessary transport and CO₂ emissions.

Rockwool return programmes are available in many countries, including UK, Denmark, France, Germany, and the Netherlands.

View our video at www.rockfon.co.uk/upcycling
REDUCING CARBON EMISSIONS
The total portfolio of Rockwool products (including Rockfon products) sold in 2009 saved 4 billion tonnes of CO₂ — equivalent to the CO₂ emissions of India, Russia and Germany combined.

Over its lifetime, Rockwool insulation saves so much energy in buildings and industrial processes worldwide that the energy and emissions used to make it are recouped several times over. For example, a 250mm Rockwool loft insulation product saves more than 100 times the primary energy and CO₂ needed for its manufacture, transport and disposal. The energy and CO₂ balances become positive only five months and four months respectively, after installation in the building.

SOUND PERFORMANCE
Rockfon ceilings provide acoustic comfort by reducing echo and reverberation; improving speech intelligibility, concentration and thus contributing to the well-being and health of the buildings’ occupants.

For example, installing a Rockfon ceiling in a 120m² office can reduce the noise level by 6dB, which corresponds to eliminating 75% of the original noise in the room.

DIABASE ROCK
Diabase rock is the primary raw material used to make Rockfon and Rockwool stone wool products. Every year, volcanic activity and plate tectonics create extremely large reserves of this rock, making it a renewable resource.

In a world with 7 billion inhabitants, many natural resources will be consumed faster than nature can replace them. Stone is different. The natural reserves are enormous. For example, there is enough basalt to supply stone wool production for 1 billion years. The Nain providence of Labrador, Canada, contains 0.5 billion megatons of anorthosite — enough alone to sustain global stone wool production for more than 100 million years. All raw materials used for stone wool production, therefore, are plentiful and abundant.

STONE WOOL MANUFACTURING PROCESS
Stone wool is produced by mixing diabase rock and recycled material with foundry coke. The mixture is poured into a vertical furnace, where it melts at 1500°C. The melt flows over high-speed spinning wheels, where a binder is added to the material. A horizontal airflow blows at a speed of 170 m/s, turning the magma into intertwined fibres. When cooled the stone wool has a density approximately 100 times lower than the original rock.

At this heat level, organic waste is burned cleanly to produce energy, reducing factory consumption of fossil fuels.

A by-product of the melting process is pig iron. The metal is reused in the steel industry. The estimated output is 97% stone wool and 3% metal.

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GREATER ENERGY EFFICIENCY
Rockfon ceiling tiles have a high thermal insulation value and can contribute to the reduction of energy consumption in certain applications. The high light reflection of Rockfon surfaces also helps save energy on electrical lighting.

With some lambda values as low as 0.037W/mK, Rockfon ceilings are the best choice for thermal insulation with acoustic absorption. Solutions such as acoustic islands, baffles and wall absorbers contribute to the energy efficiency of thermal mass and thermo-active building systems, as they allow the free movement of air in the room while at the same time providing acoustic comfort.

BUILT TO LAST — HANDLING AND HUMIDITY
Rockfon products are lightweight and easy to cut, come with a 15–year guarantee and provide excellent resistance to handling and humidity. They can withstand up to 100% RH at 40°C and stay flat, do not sag in humid conditions and do not require acclimatisation on site, making them highly cost effective over time.

LOW IMPACT ON INDOOR AIR QUALITY
All Rockfon products are classified as E1 products which guarantee they are below any legal requirement for Formaldehyde emissions in the EU. The use of materials satisfying class E1 (BS EN 13964) enables qualification for BREEAM credits.

Furthermore, stone wool is a safe material to work with. The World Health Organisation's International Agency for Research on Cancer (IARC), has classified that stone wool has no carcinogenic impact. This conclusion is based on epidemiological studies.

BRIGHTER INTERIORS
Rockfon unobtrusive matt white ceilings are highly reflective (85–87%) and provide a uniform diffusion of light. They help designers to achieve the most cost-effective balance between natural and artificial light, while reducing lighting bills and creating a health and effective working environment for eyes.

FIRE RESISTANCE
Rockfon meets and exceeds the fire safety norms in all European countries. Incombustible stone wool is the safe basis of all Rockfon's ceiling products; most are rated A1. Rockfon ceilings satisfy the most stringent criteria for smoke generation.

BUILDING CERTIFICATIONS
For those looking to certify a building using BREEAM or other programmes, Rockfon products can help achieve their goals by delivering products and solutions with documented properties.

In today’s world, buildings need to go beyond being simply “green” and become sustainable. They should contribute to improving social and economic issues such as health, wellbeing, efficiency and whole life cycle costs.

Rockfon ceilings fit the bill. Due to their relatively low mass, suspended ceilings have a very low environmental impact, when compared to other elements in the building. They also contribute actively to sustainability by creating a comfortable acoustic environment, helping increase user productivity and wellbeing, and being highly durable.

BRE APPROVED ENVIRONMENTAL PROFILE
Rockfon recently underwent the stringent, independent BRE Life Cycle Assessment. The findings showed that the Rockfon Pacific A24 600 x 600 x 12mm ceiling system has the lowest Ecopoint score ever to date (Certificate No. ENP423a). This score takes into account not only recycled content, but also all the aspects of manufacturing, recycling procedures, logistics, and transportation of raw materials and finished goods.

Visit www.greenbooklive.com to read the results for yourself.

To find out more visit www.rockfon.co.uk/upcycling