



The Floor is Yours



DESSO SoundMaster[®]

The carpet that improves acoustics

Content

| | |
|--|----|
| Innovation to improve the quality of everyday life | 5 |
| The impact of noise | 7 |
| What is noise? | 8 |
| Dimensions of acoustics | 10 |
| Sound absorption | |
| Impact sound insulation | |
| Signal-to-noise ratio | |
| Reverberation | |
| The carpet that improves acoustics | 12 |
| Expertly designed to create quiet spaces | 15 |
| Proven effectiveness in improving acoustics | 16 |
| A sound solution | 18 |
| Enhancing acoustic quality | 21 |
| Improving acoustics in the office | 22 |
| Creating the optimal educational environment | 25 |
| Providing the silence for optimal healing | 26 |
| The carpet that improves acoustics | 28 |



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Grids 9013

Innovation to improve the quality of everyday life

At Desso, we are always asking ourselves how our carpet solutions can do more for people in their daily lives. The development of products that make a difference is at the heart of our business.

Desso is committed to delivering superior products and developing pioneering solutions through continuous innovation. Our innovation strategy is concentrated in 3 key areas:

- Creativity** Spearheaded by Desso's design philosophy CARPETECTURE® and our international concept Circles of Architects®
- Functionality** Pioneering solutions that make a difference, such as DESSO SoundMaster®, DESSO AirMaster®, DESSO Light Reflection Master®
- Cradle to Cradle®** Developing products and processes that will contribute towards a better environment and indoor quality

Our carpet solutions already contribute to providing outstanding performance qualities for enhanced human well-being. However, we keep looking for improvements to go one step further. DESSO SoundMaster® is a key example of an innovative solution that takes design and functionality to the next level. It contributes to better working and living conditions in offices, schools, care centres and other commercial environments.



The impact of noise

Sound is all around us; with a distinction to be made between the sound we want and the sound we have to put up with. Sound can be functional and pleasant, but when sound becomes noise, it can be disturbing or even affecting human health.

Noise can have an adverse impact on people in offices, classrooms, hospitals and other commercial buildings¹⁾, interfering with their daily activities at work or school and at home. People's performance levels and ability to concentrate can be negatively affected by noise and it can make it harder for them to share knowledge with one another. It can also reduce their levels of comfort and well-being, and even cause health problems²⁾³⁾⁴⁾ such as hearing impairment (e.g. tinnitus or hearing loss), voice problems, cardiovascular diseases, sleep disturbance and increased stress levels.

The impact of noise has long been underestimated, but is now a growing concern among both the general public and policy-makers. The World Health Organisation (WHO) even indicates that at least one million healthy life years are lost annually from environmental and occupational noise in Western Europe²⁾. In addition to existing international legislation (e.g. EU Directive 2003/10/EC), WHO has started to develop suitable guidelines⁵⁾ on noise to protect people against its impact.

¹⁾ Noise in figures, European Agency for Safety and Health at Work 2005.

²⁾ Burden of disease from environmental noise, World Health Organisation, 2011

³⁾ Environmental noise and health in the UK, Health Protection Agency, 2010

⁴⁾ Center for Hearing and Communication, US, www.chchearing.org

⁵⁾ As part of the Health 2020 project; developing the new European health policy, together with Member States and other partners

What is noise?



Noise is an unwanted sound; its intensity is measured in decibels [dB(A)]. The decibel scale is logarithmic, so a three decibel increase already represents a doubling of the noise intensity⁶⁾. Duration of exposure is another important factor to determine the potential risk of noise.

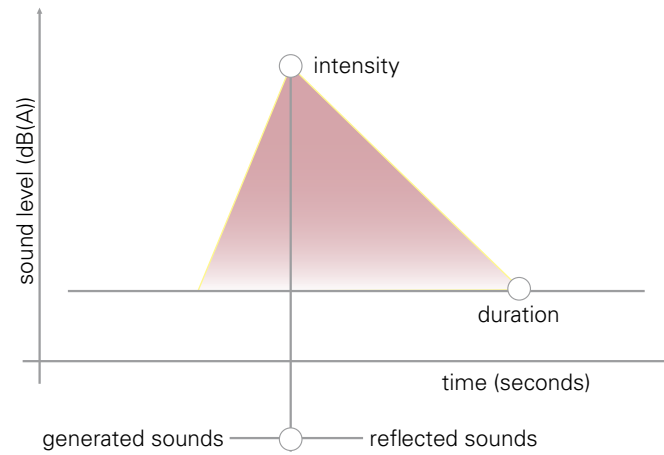
We are not used to seeing noise as a problem, but the unwanted type of noise is unfortunately all around us, often 24 hours a day. It comes from many sources and can cause health problems even when it is not particularly loud. Furthermore, there is the cocktail party effect, where people feel the need to raise their voices or turn up the volume of their devices above the existing noise, making the overall problem worse.

Some common sounds and their decibel levels:

- Rock concert, jet take-off, gun shot 120 to 140 [dB(A)]
- Power tools, motorcycle, manufacturing plant 90 to 100 [dB(A)]
- Dishwasher, computer room, busy restaurant 75 to 90 [dB(A)]
- City traffic, office equipment, cell phone, loud radio 70 to 80 [dB(A)]
- Normal conversation 50 to 70 [dB(A)]

| Occupation / workplace | Recommended limit [dB(A)] ⁶⁾ |
|-------------------------------------|---|
| School rooms | 30 - 40 |
| Offices | 30 - 40 |
| Open plan offices | 35 - 45 |
| Laboratories with routine work | 35 - 50 |
| Manufacturing workplaces, workshops | 65 - 70 |
| Health sector | 30 - 45 |

⁶⁾ Four hours of noise exposure at 88 dB(A) is estimated to deliver the same noise intensity as eight hours at 85 dB(A); Noise in figures, European Agency for Safety and Health at Work (2005)



Sound absorption

Sound absorption⁷⁾ indicates the noise and echo effect in an area and is expressed by the (weighted) α value (α_w). An α_w of 0.00 means no sound will be absorbed by the material; a value of 1.00 means all sound has been absorbed. Sound absorption positively affects both intensity and duration of noise.

Dimensions of acoustics

Acoustics is the interdisciplinary science that deals with the study of sound/noise.

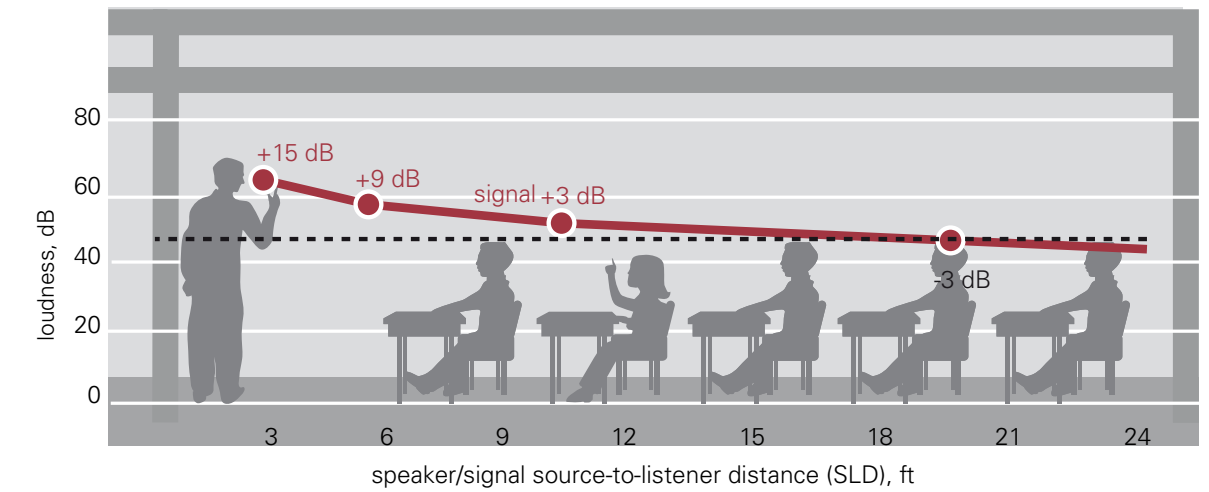
Acoustics can be measured in the following ways:

- Sound absorption (α_w)
- Sound impact insulation (ΔL_w)
- Signal-to-noise ratio
- Reverberation

Impact sound insulation

Sound insulation⁷⁾ relates to the acoustical impact of noise such as the sound of footsteps in an adjoining room or a room underneath. The ΔL_w value is measured in decibels (dB); this relates to the actual number of decibels reduced by the floor covering.

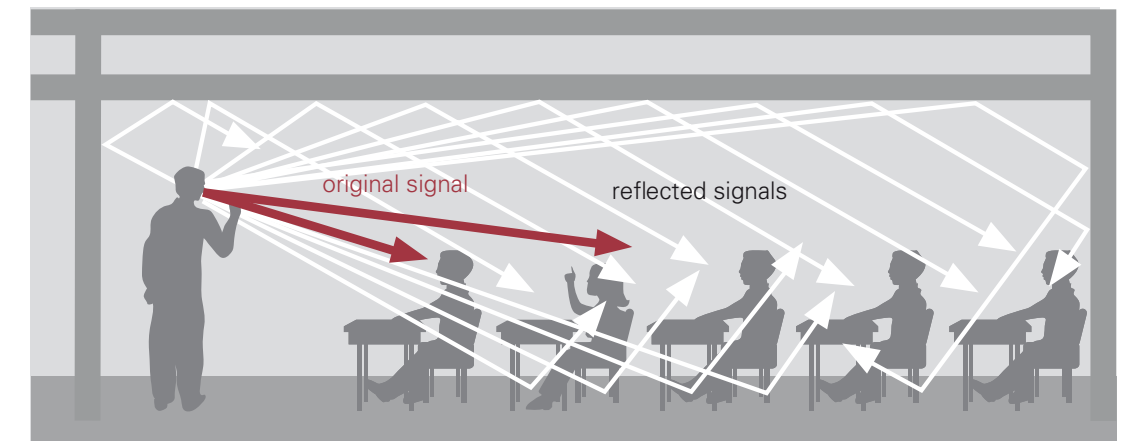
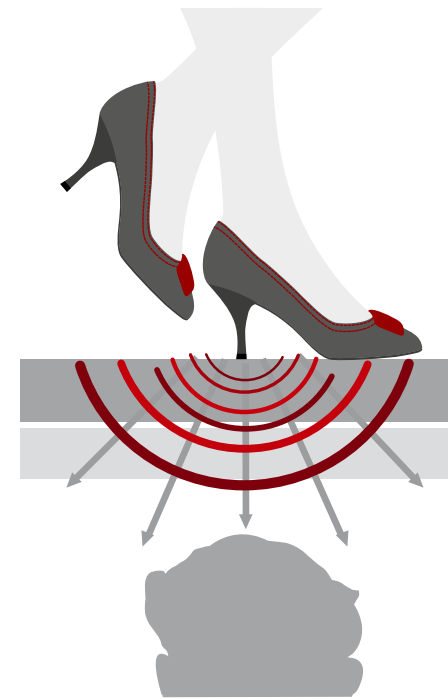
⁷⁾ GUT, Gemeinschaft Umweltfreundlicher Teppichboden, in ECRA Carpet manual



Signal-to-Noise Ratio

Signal-to-Noise Ratio (SNR) assesses the intelligibility of spoken information by comparing the loudness of the voice (signal) to the background sound level (noise). Experts have concluded that an SNR of +12 dB to +15 dB throughout the classroom provides the acoustical environment necessary for all students to fully understand oral messages⁸⁾.

⁸⁾ 'Speech and hearing research', Finitzo-Hieber&Tillman, 1978, p.440-458; 'Language, speech and hearing services in schools', Cranel&Smaldino, 2000, p.31/366



Reverberation

Reverberation is defined as the persistence of sound in a room after the source has stopped. It is commonly known as an echo. The time it takes for reverberations to stop is called the reverberation time. Some reverberation is needed to reinforce the original signal, but too many reverberations negatively affect the intelligibility of speech, as it becomes difficult to distinguish between different words⁹⁾.

⁹⁾ 'A New Standard for Acoustics in the Classroom', Trane Commercial Services, Engineers Newsletter - Vol. 32 No. 1, 2003

DESSO SoundMaster®

The carpet that
improves acoustics



In general, carpet can contribute to improving the acoustics in many environments, such as offices, schools and care homes. DESSO SoundMaster® performs even better against all acoustic measures.

DESSO SoundMaster® offers an **impact sound insulation value (ΔL_w) up to +15 dB above the standard value¹⁰⁾**, thereby setting a new industry standard in carpet performance. Carpet in general reduces the impact of sound by between 20 and 30 decibel¹¹⁾.

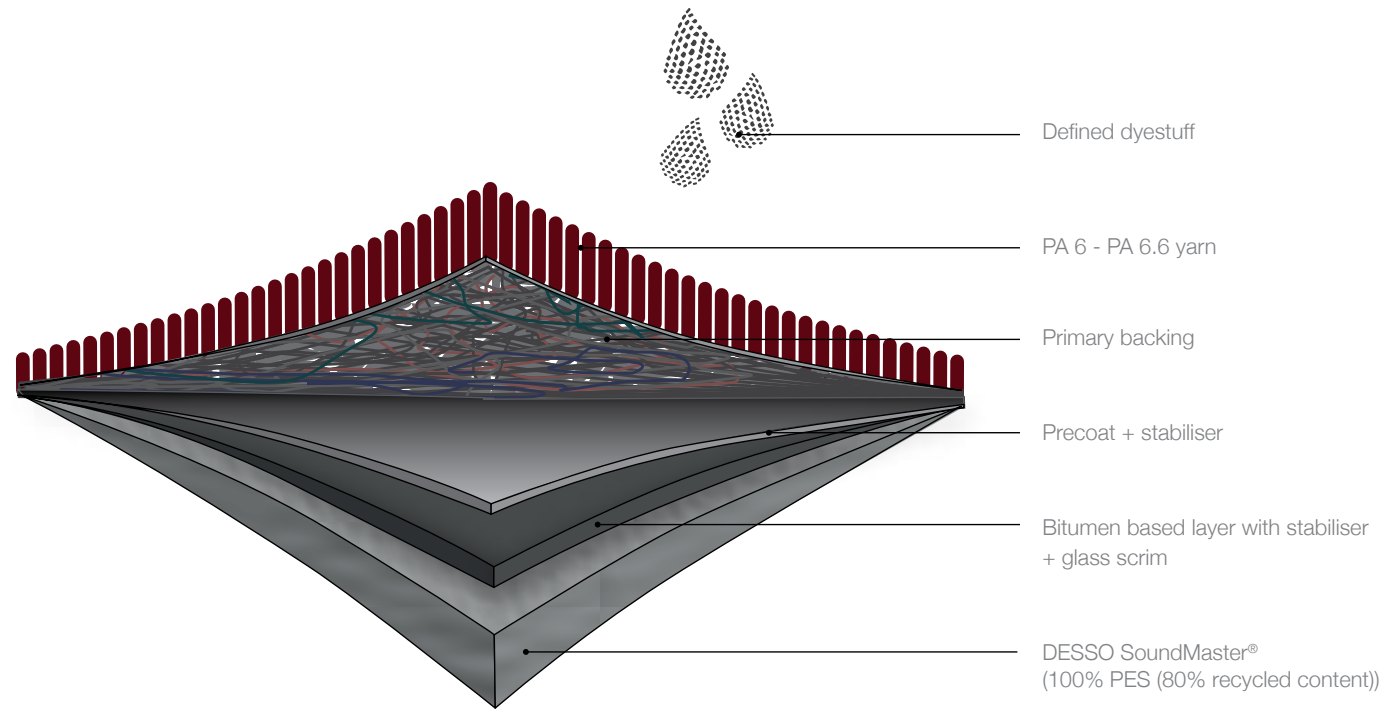
DESSO SoundMaster® achieves an **improvement in sound absorption performance up to +0.15 (α_w)¹⁰⁾**, equivalent to up to +100% improvement in comparison to standard carpet designs (α_w value between 0.15 and 0.20)¹²⁾.

Through these two improvements DESSO SoundMaster® also positively influences the signal-to-noise ratio and the reverberation effect by lowering the background noise.

¹⁰⁾ Tests performed at SWA (Schall- und Wärmemessstelle Aachen GmbH) – Institut fuer schalltechnische und wärmetechnische Prüfungen-Beratung-Planung

¹¹⁾ To compare: other flooring solutions (non-carpet) generally give a value between 5 and 10 dB.

¹²⁾ To compare: other flooring solutions (non-carpet) generally give a value between 0.05 and 0.10.



DESSO SoundMaster®

Expertly designed to
create quiet spaces

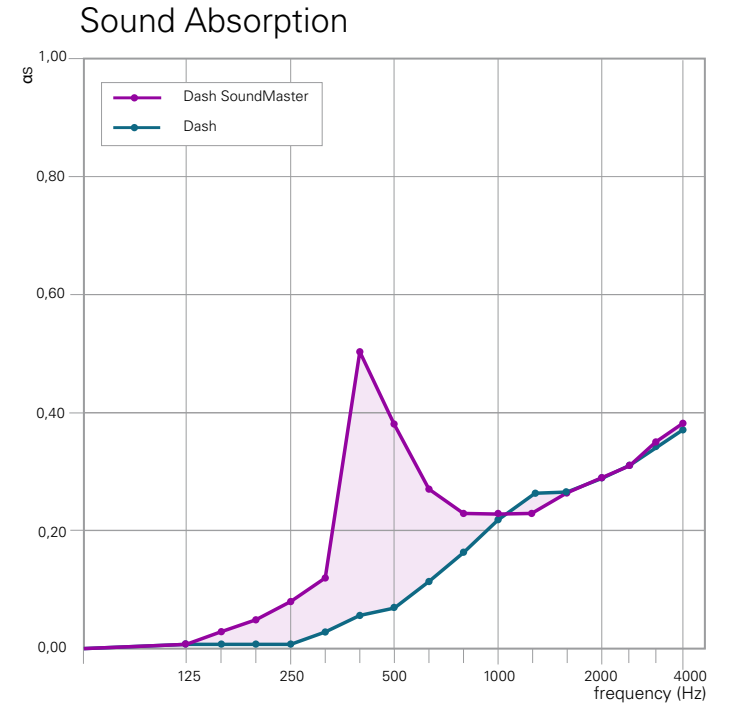
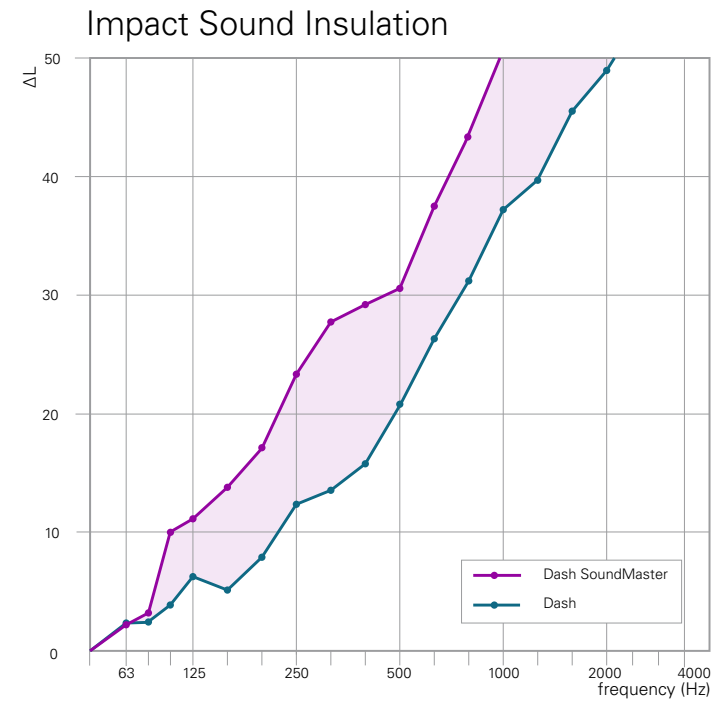
DESSO SoundMaster® helps to create a productive and calm environment in offices, schools, hospitals and other commercial buildings. The layered design of the carpet tile, and especially the SoundMaster® backing, optimises the sound absorption and sound insulation. This felt backing is made from 100% polyester (**80% recycled**) and is specifically chosen for its advanced sound insulation and absorption properties. Additionally, it offers an even more comfortable underfoot feel than standard carpet.

On top of its expertly designed functionality, the SoundMaster® backing is a clear example of up-cycling with its 80% recycled content from used PET bottles.



DESSO SoundMaster®

Proven effectiveness
in improving acoustics



The acoustic tests are performed under laboratory conditions by the independent, accredited German test institute SWA¹³⁾, which specialises in acoustic and heat technical tests and consultancy.

The carpet is tested on **impact sound insulation** on a concrete floor¹⁴⁾, dropping a small standardized metal ball from a given height (simulating foot steps) and measuring the sound in the room underneath. The test results measured at different frequencies are weighted into one single value ΔL_w . DESSO SoundMaster® delivers results up to +15 dB.

For **sound absorption** measurements, the carpet is installed in a small standardized reverberation room where a test sound is played at various frequencies. The test results are weighted into one single value (α_w). DESSO SoundMaster® produces an average result of up to +0.15 (α_w), or an improvement of up to +100% compared to standard carpet. However, as the graph on the right page shows, it performs best at frequencies between 125 and 1000 Hz, typically the range that covers many common sounds (such as human speech¹⁵⁾).

Examples of such test results are presented in the graphs on the right page ¹³⁾¹⁶⁾.

DESSO SoundMaster® offers an **impact sound insulation value (ΔL_w)** of up to +15dB above the standard value and **an improvement up to +0.15 in sound absorption performance (α_w)**, or up to +100%, in comparison to our standard carpet designs¹³⁾.

¹³⁾ SWA (Schall- und Wärmemesstelle Aachen GmbH) – Institut fuer schalltechnische und wärmetechnische Prüfungen-Beratung-Planung

¹⁴⁾ 140 mm reinforced

¹⁵⁾ Titze, I.R. (1994). Principles of Voice Production, p. 188, and Baken, R. J. (1987). Clinical Measurement of Speech and Voice, p. 177.

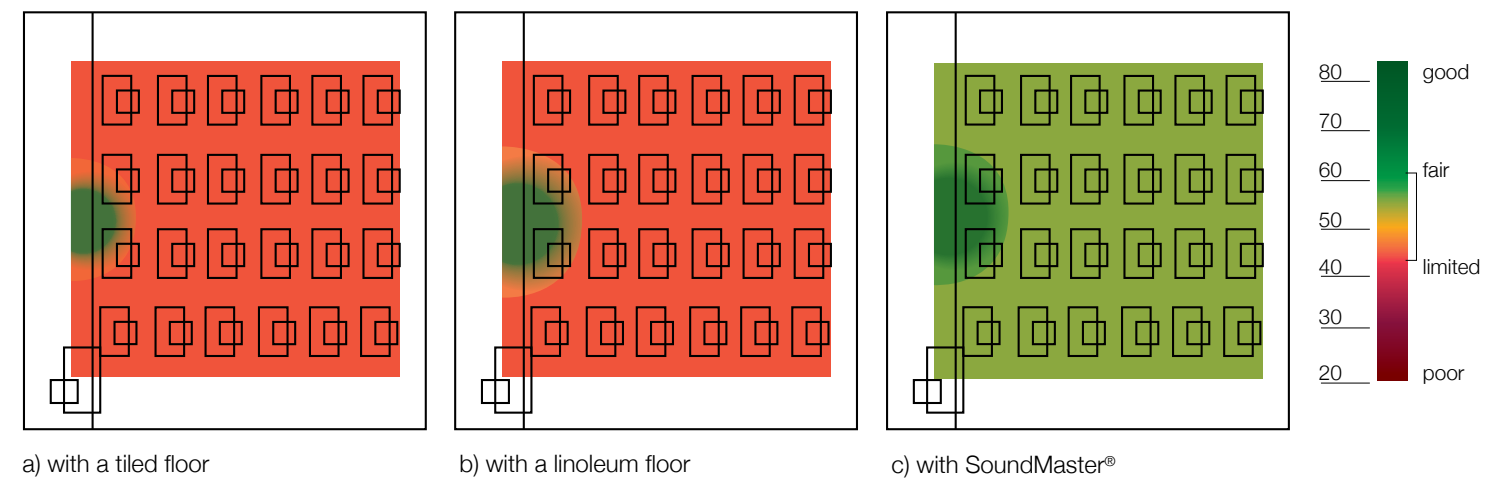
¹⁶⁾ Results depend on multiple aspects, including structure, density and pile fibre material

DESSO SoundMaster®

A sound solution



Speech intelligibility in the classroom with various floor coverings



Further tests performed by the acoustical engineering agency Bureau De Fonseca (based in Belgium) provided more evidence that DESSO SoundMaster® carpet tile backing helps to improve acoustics and therefore the learning environment in the classroom¹⁷.

Both specialised software analysis¹⁸⁾¹⁹⁾ and on-site measurements in a real classroom situation show that carpet with SoundMaster® backing achieves a **shortening of the reverberation time** and a **reduction of the background noise** in comparison to ceramic tiles and linoleum. This achievement is based on the improvement in both sound absorption and impact sound insulation by using DESSO SoundMaster®.

Additionally, the sound (i.e. simulating the teacher's voice) was shown to be better distributed across the room when fitted with carpet tiles with SoundMaster® backing²⁰. This is visualised in the graphics above.

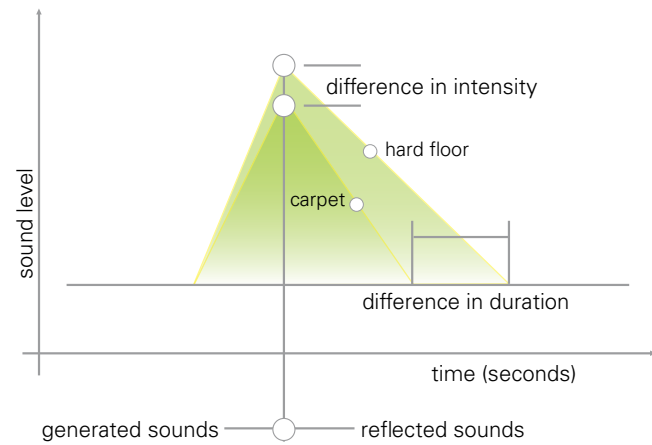
¹⁷⁾ The influence of floor coverings on acoustic quality in classrooms, De Fonseca & van de Merckt, 2010

¹⁸⁾ CATT Acoustic software for room acoustics simulations and predictions in a specific room simulation (64 sqm, with 24 student desks and one teacher's desk, and windows, doors, walls, ceiling and blackboard identified as acoustic hard surfaces).

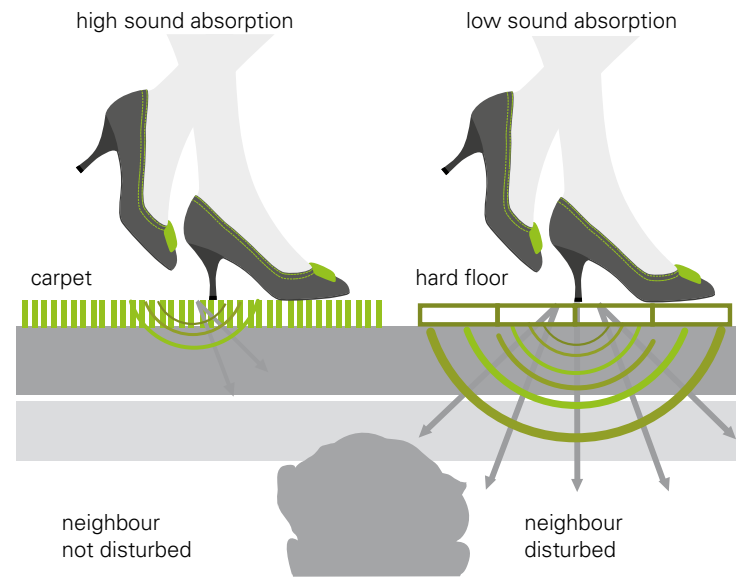
¹⁹⁾ The acoustic quality of the classroom was evaluated with three different floor coverings: ceramic tiles, linoleum and carpet with SoundMaster® backing.

²⁰⁾ The spatial distribution of speech improved from 'limited' (with ceramic tiles or linoleum) to 'fair' (with DESSO SoundMaster®) as the improvement in acoustic quality is uniformly distributed across the room

Sound Absorption



Impact Sound Insulation



DESSO SoundMaster®

Enhancing
acoustic quality

According to the additional research by Bureau De Fonseca, DESSO SoundMaster® improves the acoustic environment in three ways²¹⁾:

1. It limits the reverberation time by reducing acoustic reflections (improved sound absorption)
2. It reduces the generation of disruptive sounds within the room, such as the scraping of chairs and the sound of footsteps (improved impact sound insulation)
3. It reduces the background noise caused by external sounds (improved sound absorption and improved sound insulation).

²¹⁾ The influence of floor coverings on acoustic quality in classrooms, De Fonseca & van de Merckt, 2010

Improving acoustics in the office



Less noise means more productive workforces. Quieter environments prevent health problems occurring²²⁾²³⁾, reduce stress levels and improve concentration. This is especially important in open plan offices (a growing trend in the 'office of the future') where people need a space both for quiet concentration and open communication and where they need a place for private conversations as well as large-scale meetings.

Additional noise from external factors such as traffic, heating and air conditioning and computer equipment make it hard for managers to achieve the optimum level of noise within buildings²⁴⁾.

That is why good sound absorption and sound insulation is so important. And the best and most cost effective option comes with a SoundMaster[®] carpet tile backing as opposed to the other often more expensive options such as ceilings, walls and panels.

²²⁾ Environmental Noise and Health in the UK, Health Protection Agency, p.57-58

²³⁾ Noise in figures, European Agency for Safety and Health at Work, p.70-73

²⁴⁾ According to the European Agency for Safety and Health at Work the recommended noise level is 30-45 dB(A) while even in 'quiet' offices the average noise level is often between 40-45 dB





AirMaster® 8508



Creating the optimal educational environment

A bad sound environment can be a major problem for teachers, especially today when classes are designed to be more interactive.

Many teachers are having to try to teach effectively in a noisy environment and suffer from health problems such as sore throats, leading in some cases to absenteeism²⁵⁾. In a German study²⁶⁾ amongst teachers 50% of the respondents reported voice problems, with 16% even experiencing temporary voice loss (about three times higher when compared to other professions). A US study²⁷⁾ found that 20% of the respondents had missed work in the past year as a result of voice problems.

Noise is also perceived as a disturbing factor in the learning process of pupils and students, affecting their concentration levels and ultimately their performance.

Using a carpet, and especially one with the sound absorption and sound insulation properties of DESSO SoundMaster®, can be a very good way to improve the effectiveness of teaching and learning.

²⁵⁾ Voice Problems of Classroom Teachers: Incidence, Symptoms, and Associated Factors', Phillips, Gillespie, Thompson, University of Montevallo, 2004

²⁶⁾ Relationship between subjective voice complaints and acoustic parameters in female teachers' voices. Rantala & Vilkmán, 1999

²⁷⁾ Frequency and effects of teachers' voice problems. Smith, Gray, Dove, Kirchner, Heras, 1997

Providing the silence for optimal healing



A quiet environment is crucial for patients in hospitals and people living in care homes²⁸⁾. Using carpet tiles with DESSO SoundMaster[®] can reduce the noise that can negatively affect people's health and well-being when they are at their most vulnerable.

The improved sound insulation of SoundMaster[®] reduces noise from footsteps and trolleys in the hallway as well as on adjoining floors, while the sound of voices and other external factors such as heating, air conditioning and (medical) equipment is absorbed more effectively than is the case with other flooring types (especially the more commonly used hard floors, including even those that have features to improve the acoustics).

Additionally, carpet contributes to a higher standard of comfort with softer underfoot feel and causes fewer accidents with its firmer surface. If a patient should fall, the chance of injury is much lower when compared to hard floors (1.5% instead of 4%)²⁹⁾.

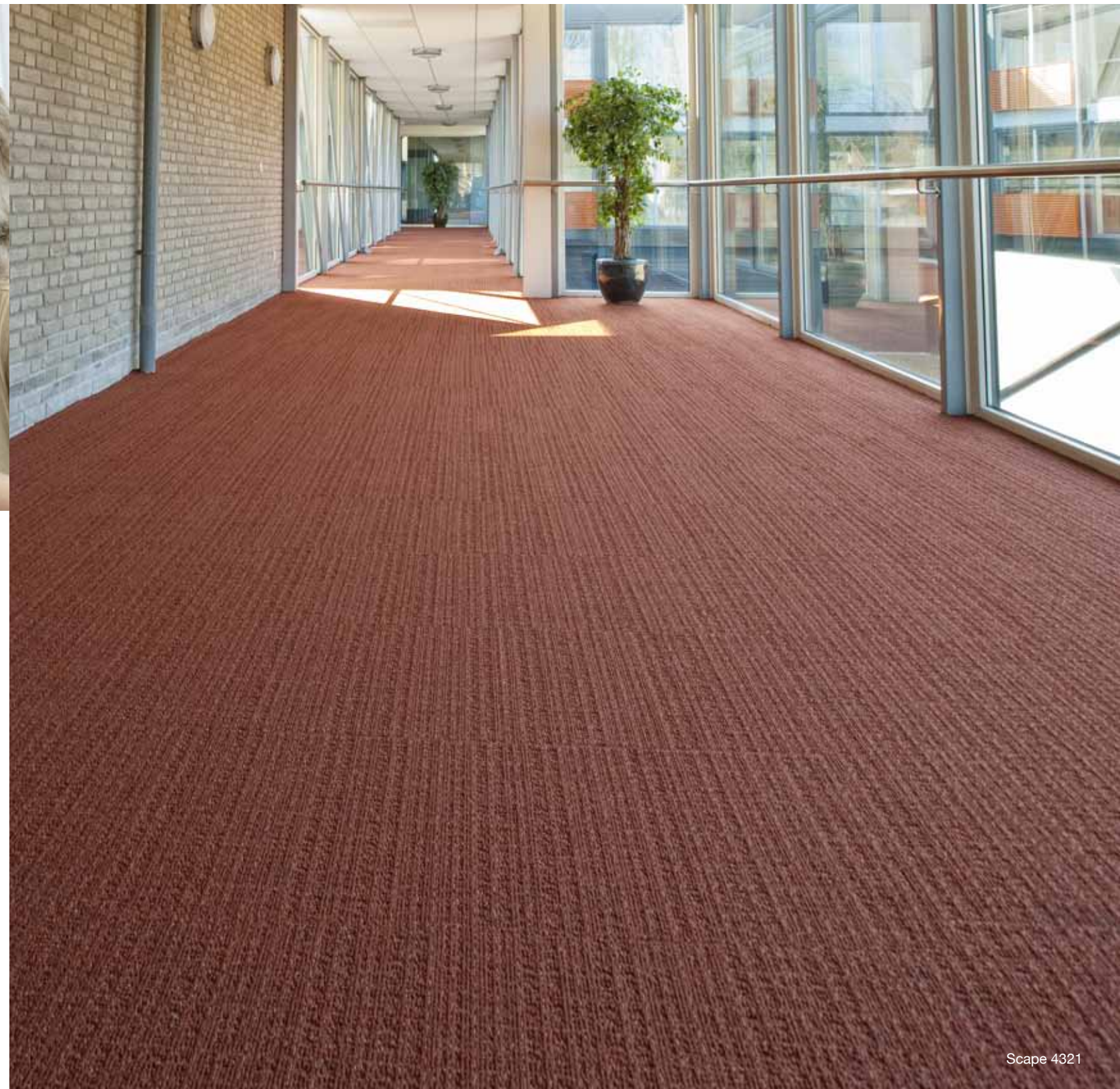
Installing carpet also improves the indoor air quality: carpet captures fine dust from the air twice as effectively as hard floors³⁰⁾, so there is less chance any patient will inhale it. And you can improve the indoor environment even more with DESSO AirMaster[®] which is eight times more effective at capturing and retaining fine dust than hard floors³¹⁾. This is also available with SoundMaster[®] backing, so you can significantly improve both the air and sound quality with the one product.

²⁸⁾ WHO recommends 30-45 dB(A), with 30 dB(A) during the night (Noise in figures, European Agency for Safety and Health at Work, p.48)

²⁹⁾ 4 mm loop pile carpet (Booth et al., BR Orth. Res. Soc. Proc., Sept.)

³⁰⁾ Study performed by Deutscher Allergie- und Asthmabund e.V. in 2005

³¹⁾ Study performed by GUI (Germany) and TNO (Netherlands)



DESSO SoundMaster®

The carpet that
improves acoustics



Generally, Desso carpet improves acoustics and reduces noise. DESSO SoundMaster® takes this functionality to a new level – making a vital contribution to your personal health, wellness and well-being.

Numerous factors determine the sound levels in a room. Where the building is situated; the size and shape of the room; where it is relative to other interior spaces and the construction of the ceiling, walls, and floor.

However, with its large surface and all-over presence, the floor is a key element for improved acoustics.

The installation of DESSO SoundMaster® offers a significant acoustical improvement in offices, schools and hospitals, for better working, learning and healing environments and the enhanced health, wellness and well-being of its users.

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The Floor is Yours

About DESSO®

Desso focuses primarily on superior floor design and Cradle to Cradle®, in providing high quality carpet tiles and broadloom. Its commercial product offering, business carpets, represents more than half of total sales and can be found in offices, banks, retail units, public buildings, schools, universities and care centres. Customers include ABN AMRO, Rabobank, AkzoNobel, Dutch Ministry of Safety & Justice, KPMG, PWC, Deloitte, Allianz, Canon, EDF, HSBC, Porsche, Procter & Gamble, SNCF, Nestlé and many more.

Desso's innovation strategy is concentrated in 3 key areas: Creativity, Functionality and Cradle to Cradle®. For Desso, creativity is synonymous with CARPETECTURE®, which is a powerful example of Desso's commitment to creative carpet design and its dedication to meet the needs of architects, interior designers, building owners and end users. In the field of functionality, Desso develops pioneering solutions that make a difference for health, wellness and wellbeing. As a result of this innovation and creativity strategy, Desso has launched a number of patented products like DESSO AirMaster®, for 8 times lower fine-dust concentration in the air (versus hard floors), and DESSO EcoBase®, which enabled Desso to achieve a Cradle to Cradle® silver certificate for an entire carpet tile product.

Desso Consumer Carpets is represented by three strong brands: Parade, Bonaparte and Desso. All with a rich history in manufacturing high-end consumer carpets where products are available through specialist retail traders, plus selected carpet stores and home furnishing shops. Desso Consumer Carpets is the only European high end consumer carpet company with sales in Benelux, Germany, France, Switzerland and Austria.

Desso's creative carpet design and service oriented approach has enabled Desso to become a leader in developing solutions for the Hospitality, Marine and Aviation (HMA) markets. Desso's HMA division works with companies such as Hilton, Intercontinental, Maritime, KLM, China Airlines, Royal Caribbean Cruise Lines and Holland America Line.

Desso Sports is a leading player in the provision of artificial turf for sports fields and reinforced natural grass systems that provide the perfect surface at every level of sport. DESSO GrassMaster® is a sports field of natural grass reinforced with Desso synthetic grass fibres, which has been installed in two Euro 2012 stadiums and in 'football temple' Wembley.

Cradle to Cradle®

In signing a partnership agreement with the Hamburg-based Environmental Protection Encouragement Agency (EPEA), Desso has become the first carpet manufacturer in EMEA to adopt the Cradle to Cradle® design. It marks Desso's radical decision to move beyond 'mere' sustainability in producing its carpets and artificial grass. In the Cradle to Cradle® principles, products are made from positively defined* components that are easy to disassemble, in order to create new products in both the biological and technical cycles.

Desso is active in more than 100 countries and can look back on almost 80 years of proven performance, having built a reputation as a leading manufacturer of high quality carpet tiles, broadloom and artificial grass pitches.

Desso has four factories and a major distribution centre in Europe, as well as specialist customer service centres throughout Europe, in America, Asia, Latin America, Africa, the Middle East and Australia.

For more information please visit: www.desso.com

*Positively defined = all ingredients have been assessed as either Green (optimal) or Yellow (tolerable) according to the Cradle to Cradle® assessment criteria. As described in the Cradle to Cradle® Certification Program Version 2.1.1, prepared by MBDC September 2008, updated January 2011.

