SUSTAINABLE FLOORING SOLUTIONS

nora® rubber floor coverings and system solutions

nora®

All About Flooring. **All About You.**

GOOD INDOOR AIR ALSO HAS TO DO WITH THE FLOOR

Environmental preservation and healthy living have long formed a key element of our corporate philosophy.

The ecology concept has meanwhile acquired a new dimension, both socially as well as for us as a company. Whereas previously the primary concern used to be products that were as environmentally sound as possible, today the focus is on an integral consideration of buildings, from choosing the resources through to the production process and the utilisation and disposal of the building materials that are used.

We are a pioneer in this regard as well. We are the first manufacturer of resilient floor coverings to have been subjected to a comprehensive analysis process, and were awarded the ISO 14025-compliant Environmental Product Declaration (EPD), acknowledged and coveted throughout Europe, by the Institute Construction and Environment in 2011. This declaration covers our entire norament® and noraplan® product programmes, and includes every phase of the product life cycle from the production through to installation, usage and maintenance, right up to the end of the product's life cycle in the building. It enables us to provide planners, architects, investors, decisionmakers and users with an important instrument for evaluating the ecological contribution made by our products.

Particularly in recent years, developments towards the efficient use of energy have led to more and more buildings being built as self-contained and almost "airtight" units in order to keep the loss of thermal energy as low as possible. Today the exchange with outside air – the so-called air change rate – is around ten times less than it used to be. At the same time, we spend almost 90 % of our time in enclosed buildings, both at home and at work. Although we protect our climate with this construction method, this does, however, automatically lead to higher indoor pollution levels.

What does this mean to us as a manufacturer of building products? Here is where another dimension of sustainable building comes to the fore, namely healthy living. The decisive factor is that not only must the building materials be resource-efficient and environmentally acceptable throughout the entire production process and their useful life cycles, but they should also have the lowest possible emission levels. Only then can the developer and user of a building achieve ideal hygienic indoor air conditions.

We have strived right from an early stage to consistently improve our products in this area as well, and were awarded the internationally renowned Blue Angel "for low emissions" eco-label several years ago. With our all-in-one approach, nora system blue®, we aim to go one step further and integrate the laying materials together with our floor coverings to ensure that negative interaction can be excluded once the flooring has been installed. With nora® pad, we have extended this concept so that our floorings can be cleaned, and their value preserved, by using just water to the total exclusion of cleansing and care agents. A further contribution to the environment and hygienic indoor air.

Standing still is a retrograde step. That's why we will steadily continue to work at setting sustainable standards with our products. And why are we doing this? Quite simply, so that it will become easier to build and live in an environmentally sound and healthy manner.

Alexander K. Althof
CEO nora systems GmbH

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RAW MATERIALS. nora® rubber floor coverings are made of high-grade industrial and natural rubber quality products. One of the outstanding characteristics and advantages of rubber is its ability to resiliently withstand extremely heavy use. This is why rubber is also used for products that have to meet the most stringent quality standards.

Another component of our nora® floor coverings are the selected and environmentally compatible colour pigments. Here we attach great importance to the fact that these do not contain any heavy metals or other toxic substances. Another constituent of our nora® floor coverings are minerals, most of which are derived from natural deposits such as siliceous chalk.

Production leftovers that accumulate during the manufacturing of our floor coverings, for example grinding dust and punching burrs, form part of the raw material basis for our products.

nora® rubber floor coverings do not contain any PVC, plasticizers (phthalates), halogens (such as chlorine) or chlorine-organic compounds.

MANUFACTURE. nora® rubber floor coverings are manufactured in state-of-the-art production plants in Weinheim. As far as the production process is concerned, we consistently make sure to minimise the resources we use. Coolant water circulation systems are in operation to limit the use of fresh water. In addition, the electrical power and process steam are generated in a power station in an environmentally compatible manner utilising the principle of combined heat and power generation with an overall extremely high degree of efficiency. The production processes used in our plants are stringently regulated and are among the highest standards worldwide. nora systems is certified in line with the Environmental Management in compliance with international standards such as ISO 9001 (quality management) and ISO 14001 (environmental management systems). After all, it goes without saying that we meet the same standards as those we expect of our suppliers.

PACKAGING. We offer our nora® floor coverings in both rolls and as tiles. Tiles are delivered on palettes either loosely or in boxes. We place great store on only using wooden pallets. These are reclaimed by us within the framework of a European recycling programme and can then be reused.
The boxes are manufactured on a waste paper basis and are 100 % recyclable. Roll products are rolled onto cardboard tubing made out of recycled cardboard. The cardboard cores are also taken back and reused.
Even the outer packaging of the rolls is made of recyclable paper. The single rolls are prepared for delivery in a standing position on wooden palettes, and are then shrink-wrapped using environmentally compatible and recyclable polyethylene sheeting.

PROCESSING AND INSTALLATION. We place special emphasis on the ideal health qualities of our premium products. An essential factor here is that all the building products used in the floor structure only have minimum emission levels. This contributes significantly to achieving high quality indoor air. For this reason we recommend using only especially low-emission adhesives, fillers and primers when working with nora® floor coverings.
However, we go yet another step further: we are the first enterprise in the market to offer a co-ordinated, sustainably oriented and certified floor covering system. It combines nora® rubber floor coverings with low-emission floor-laying materials, assuring long-lasting future reliability in one system: nora system blue®.
A key advantage when laying nora® floor coverings is that they do not have to be joint-sealed since they do not contain any environmentally damaging plasticizers. The dimensional stability of the rolls and tiles when they are laid means that grouting is superfluous (with just a few function-related exceptions). norament® stairtreads, stair margins and skirtings can be laid using nora Stepfix® 240 dry adhesive tapes from the roll.

USAGE. Taking into consideration the entire life cycle of a nora® product, it becomes clear that not just the environmental aspect, but also the economics are optimised.
On account of their high quality, nora® floor coverings are supremely durable, hard-wearing and resistant to wear and abrasion. Even after decades of use in highly frequented areas, they still look almost like new. This extraordinarily long lifetime contributes to the long-term preservation of the properties' value, as well as saving the resources of our earth.

CARE. Their extreme durability means that nora® premium floor coverings offer many advantages with regard to care and maintenance: expensive re-coatings are superfluous – nora® floor coverings require no coating or spraying during their entire life cycle, therefore excluding any related unsightly side-effects.
The rubber surface is post-cured at the factory, making it extremely dense and close. Consequently, they can be cared for using low-emission cleaning systems. In contrast to conventional cleansing agent methods nora® rubber floor coverings can also be cleaned using just water – with the aid of different grades of diamond-studded nora® cleaning pads.


Schutzgitter

RECYCLING OF PRODUCTION LEFTOVERS. Production leftovers have been recycled at our plants for more than 15 years. Punching burrs and grinding dust that accumulate during the production of nora® floor coverings, for example, form part of the basic raw materials for various nora® products. norament® tiles, which have a thick underlay made of recycled material as well as the top layer of new material, are produced in this manner for special applications. Accumulated, colour-pure grinding dust from the final processing stage of nora® products is sieved and then added to suitable products as a high-grade filler. Punch burrs can either be granulated and used as decorative granules for design decorations, or ground as a valuable functional filler.
Not only does the environment benefit from this recycling, but above all our customers do as well.

MANUFACTURE AND PACKAGING
Resource-efficient production processes compliant with certified international standards. Utilisation of recyclable packaging materials (e.g. wood pallets and cardboard cores).

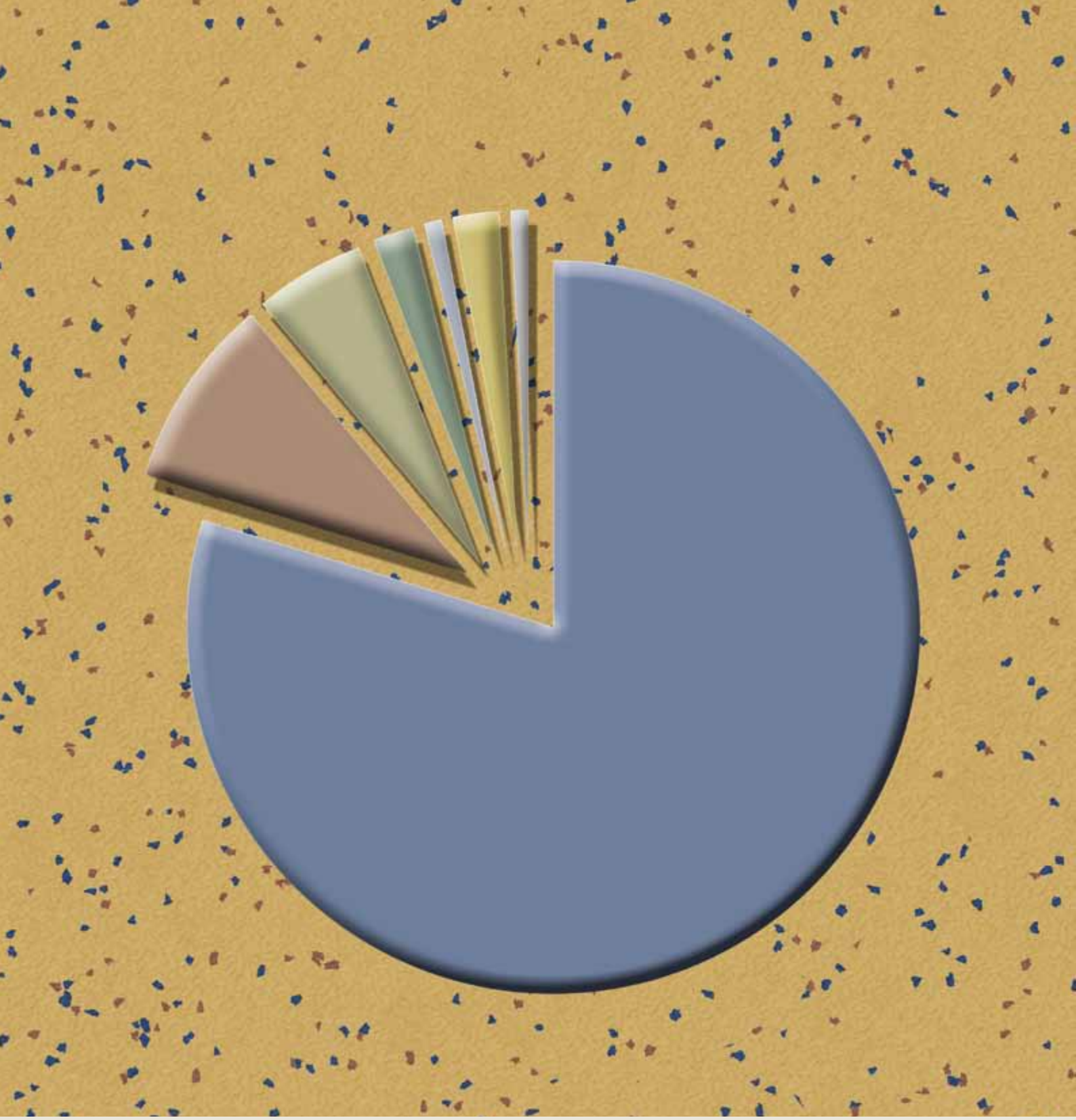
PROCESSING AND INSTALLATION
Provision of low-emission building products (adhesives, fillers and primers) for the entire floor installation. nora® floor coverings do not contain any environmentally damaging plasticizers.

USAGE AND CARE
The long life cycle of nora® floor coverings preserves resources. Re-coatings are superfluous. Flooring can be easily cleaned using low-emission products.

RECYCLING AND DISPOSAL
Numerous environmentally compatible methods of disposal and recycling. Production lefovers such as punching burrs and grinding dust are returned to the production cycle.

DISPOSAL. There are various ways of disposing of laying cuttings and removed nora® floor coverings:

1. Reclaiming by nora systems. Cuttings from newly laid floorings and removed used nora® floor coverings with no major residues of filler and screed can be reclaimed by us and recycled.
2. Material recycling. nora® rubber floor coverings are granulated and processed by special companies into fall protection mats, industrial matting or livestock pen mats and sports field coverings.
   Other recycling possibilities include using nora® granulate for thermal insulation or as insulating material and footfall sound absorption in screeds under wooden floors (e.g. ThermoDyn), or even as safety matting for flat roofs.
3. Thermal recycling. nora® floor coverings can fundamentally be used as a substitute fuel in thermal power plants instead of gas or oil.
   The energy contained in the combustible material is used here.
4. Non-residual material thermal recycling. The thermal utilisation of nora® floor coverings generates energy in the cement industry. The fillers remain in the cement clinker due to their favourable composition.
5. Disposal in landfill sites. Removed nora® rubber floor coverings do not contain any plasticizers (phthalates) or halogens (e.g. chlorine). This means that these substances cannot seep into the ground water. nora® floor coverings can therefore be safely dumped in landfill sites. (This applies to floor coverings with no adhesive or flooring residues.)



- RUBBER 79.93 %
- PAPER & CARDBOARD PACKAGING 9.15 %
- WOOD 5.36 %
- PLASTICS & PACKAGING 2.01 %
- METALS 0.72 %
- REST WASTE 2.45 %
- OTHER 0.59 %

COMPOSITION OF USEFUL MATERIALS AND WASTE.

At our plants, all useful materials are sorted and collected. This means that they can be resold, thus forming a resource cycle. The accrued rubber residual material from floor coverings and shoe materials form the largest proportion of the total amount at 79.93 %.

The pieces of rubber are directly resold. They are crushed prior to post-processing and then fed into the cement tubular furnace at a suitable cement works together with the rubber meal. Here, the fine-grained silicon oxide (which makes up more than 50 % of the floor covering) is released through combustion of the rubber portion. The finely distributed silicon oxide subsequently forms a valuable raw material for various building products made of cement such as Portland cement.

Another group of useful materials consists of paper and cardboard packaging, wood, plastics, packaging and metals. These are sorted and collected before being sold to the appropriate industrial companies.

The percentage of total material recycling at our plants meanwhile amounts to more than 75 %. The remaining substances such as mud, oil, etc. are used to generate heat or electrical energy at incineration plants.

FEDERAL ENVIRONMENTAL AGENCY (UBA) IN DESSAU.

One of the planning goals for the Federal Environmental Agency was to create an ecologically exemplary office complex. The ongoing maintenance costs should also not exceed those for a conventional building.
The environmentally compatible building materials used in the construction were also subjected to the most stringent specifications. For instance, the wood originated from certifiably sustainable forestry sources. First and foremost, however, came the environmental compatibility of the floor coverings: for hygienic reasons, textile coverings were out of the question right from the very outset. An in-depth life cycle assessment of the possible coverings was also drawn up, whereby attention was paid to the manufacturing processes and life cycles, for example. Bearing in mind the best cost-benefit ratio, the planners of the Federal Environmental Agency then decided in favour of nora® rubber floor coverings. The building owners had particularly focused on the emission behaviour of the floor coverings from the very beginning. Around 22,000 square metres of our product noraplan® uni acoustic were then laid in the building's corridors and offices, in the library, as well as in the conference rooms.

CHRISTIAAN HUYGENS COLLEGE. Aesthetics and sustainability are not mutually exclusive. The "Christiaan Huygens College" was constructed in Eindhoven as the most sustainable school in the Netherlands.
In particular, the design is characterised by the core elements of sustainability - specifically, the form of the building comprising three interconnected round structures. This means that substantially less energy is lost through the shell of the building than is the case with conventional rectangular buildings. The school, with its 850 pupils, finances itself in a similar manner to accredited private schools in Germany and must, for instance, raise its operating expenses itself. In doing so, the school's administrators completely opted for durable materials and installations. The procurement and maintenance costs were compared and examined to determine whether any possible extra costs could be balanced out within a reasonable period of time. Consequently, the building features an energy roof comprising both solar panels as well as solar cells integrated into the roof sheeting. It generates so much surplus energy that a gymnasium and more than 80 houses can be heated as well as the school. The wall construction, windows and other materials were also assessed. Here the planners oriented the classification of their building materials to the British BRE rating system, even though they eventually decided against an official overall certification of their building according to the BREEAM assessment method. The persuading factor concerning the floor coverings were the BRE A + certified nora® rubber floor coverings with their life cycle assessment and performance characteristics. noraplan® signa in seven colours is laid over a total of 6,000 square metres. The rubber floor covering meets both the specification of the school administrators for sustainable materials, as well as the wish of the architect, Thomas Rau, for a large colour spectrum.

CERTIFICATIONS

DER BLAUE ENGEL (THE BLUE ANGEL)

Success, particularly in sensitive areas such as schools, kindergartens or hospitals, necessitates as an international company ongoing development and improvements. As one of the industry's pioneers, it goes without saying that we also set standards where sustainability and health are concerned. We are one of the initiators of the German Sustainable Building Council (DGNB), and were the first company from the resilient floor covering sector to disclose extensive information on our products in EPDs (Environmental Product Declarations).

With the leading "Blue Angel" environmental certificate for the nora® product lines norament® and noraplan®, we back up our own high standards for promoting the health of users by installing nora® floor coverings.

The "Blue Angel" is the world's best known environmental label, and was the very first one to be introduced. It has been setting standards for environmentally friendly products and services ever since 1978. These are decided by an independent jury according to solidly defined criteria. Enterprises can be rewarded with the "Blue Angel" label for their commitment to environmental protection. The basic prerequisites for attaining this environmental label are particularly low levels of emissions of organic substances and the absence of carcinogens and formaldehyde. Classified into four protection targets, the "Blue Angel" defines which of these targets the respective product makes a special contribution. The target "Protects health" was chosen for floor coverings.

nora® floor coverings have been bearing the "Blue Angel" environmental label in compliance with the qualification guideline RAL UZ 120 since 2006, the very first resilient floor covering to do so. These coverings were distinguished for their low emissions and health protection properties. As well as noraplan® floor coverings, norament® 926 in its various designs also meets UZ 120 standards.

The purpose of this certification is to provide better information for consumers and to protect them and the environment, and in doing so be conducive to environmental quality and health. The "Blue Angel" thus makes a decisive contribution to accelerating the use of the best possible ecological properties and the sustained developments of products.

BRE RATING

noraplan® floor coverings with the formulation 913 have been certified in line with the BRE certification system for the environmental profiles of construction products.
The ecological score acquired during the certification process resulted in the best possible rating "A+" according to the "Green Guide Specification" for the health care and education segments, as well as for commercial and service provider chains.

BRE Certification Ltd. is a non-profit organisation that assesses the environmental qualities of products. BRE Rating Ltd. specialises as an external approval and certification body in the areas of construction, the environment, fire protection and safety. Although BRE focuses on the construction and built-up environment sectors, its services are currently being utilised worldwide by customers in numerous industrial segments ranging from the chemical industry through to the aerospace industry.

ISO 14001

We are one of the first enterprises in the floor covering industry to receive certification in compliance with ISO 14001 for environmental management systems.

The ISO 14001 environmental management standard was introduced to help organisations to minimise their environmental impact, comply with applicable legislation, regulations and other environment-related provisions, and to become capable of continually improving their performance.
As proof of our utilisation of standardised processes, we have also received ISO 9001 certification for our proprietary quality management system.

GREENGUARD

All of our standard products and adhesives have the GREENCARD certificate for indoor air quality and, due to their low-emission materials, contribute to the LEED (Leadership in Energy and Environmental Design) performance credits for indoor environmental quality.

The GREENGUARD Certification Program℠ is a cross-industry, external test programme for low-emission products and materials. In 2005, the Greenguard Environmental Institute published the GREENGUARD standard for children and schools, which takes into account the sensitivity of school children in conjunction with the specific characteristics of school buildings and lays down the strictest criteria to date for product emissions.

Today, more than 150 manufacturers from various branches of industry offer GREENGUARD® Indoor Air Quality Certified products.

DGNB

We are a member of the DGNB. The DGNB certification system (German Seal of Approval for Sustainable Building) was introduced in January 2009. The German Sustainable Building Council (DGNB) was founded in

mid-2007. One of its founding members is nora systems GmbH, for we are committed to an ecologically harmonious way of living: sustainable buildings are environmentally compatible, efficient and considerate to natural resources.

The objective of the DGNB is to demonstrate ways and solutions for sustainable building in Germany.

The DGNB focuses on the planning, quality and usage of buildings. At the same time, it checks and certifies buildings with regard to sustainability criteria based on the stringent stipulations of German civil engineering practice.

The prime target of the DGNB is to create quality in every area of importance to new buildings, since sustainable buildings are ecologically sound, economically efficient, kind to natural resources and have low operating and maintenance costs. In the long term they preserve their high value, are healthy for their users and integrate themselves perfectly into their sociocultural environment – as well as giving the user a sense of comfort.

CA 01350

All of our nora® standard products and adhesives comply with the "California 01350" standard. These products are also listed by the CHPS initiative (Collaborative for High Performance Schools) for low-emission materials, a prerequisite for which are tests for adherence to the CA 01350 standard. The products on the CHPS list of low-emission materials can contribute to the LEED score for indoor environmental quality through the use of such materials.

Cal/EPA, the Californian state environmental protection agency, developed CA 01350 as a special standard specification for environmental requirements. Covering the key facets of environmental performance with regard to the selection and utilisation of building materials, this specification lays down targets and provides an overview of special environmental needs. Among other things, it also includes guidelines for the efficient use of energy, materials and water, guidelines for indoor air quality, non-toxic grading standards for cleaning and care products, as well as guidelines for sustainable site planning and landscape design.

Key elements of the CA 01350 specification include procedures for ensuring that indoor air has the quality required to protect human health. This part of the specification contains product selection guidelines as well as emission test records for labelling low-emission materials.

(EPD) as the basis for assessing the sustainability of buildings

Internationally, there exists a whole series of certification systems that define the sustainability of buildings. These include the US system LEED, the British system BREEAM, HQE in France and the German system DGNB. At European level, a draft standard has already been drawn up containing standardised evaluation criteria.
This is based on likewise standardised product information, developed in line with uniform and tested criteria, which is provided by the respective manufacturers of building products. These EPDs, which comply with ISO 14025, conform with international definitions of Type III environmental information (ISO 14020) and are certified by a neutral body.

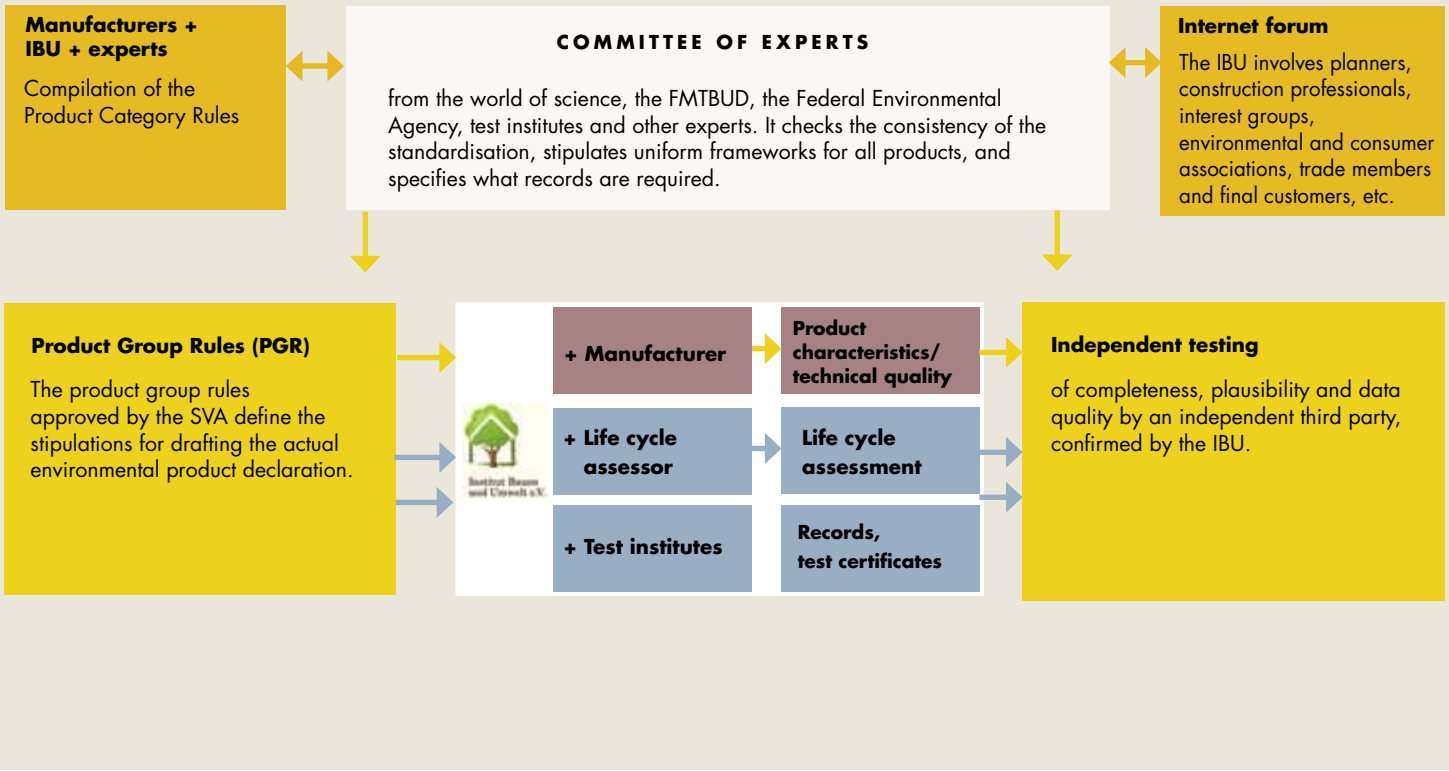
They contain information about:

- the respective product, the technical characterisation with inherent substances, together with environment and health-related information from the product life cycle
- the life cycle assessment, including the primary energy consumption (renewable and non-renewable), as well as on the potential for greenhouse effects, ozone depletion, acidification, eutrophication and summer smog
- the necessary records and tests, e.g. the emission behaviour of transient organic compounds (TOC) according to the ISO 16000 series of standards (the AgBB scheme and "Blue Angel" in Germany), as well as other relevant tests.

This information, created on a uniform basis, enables planners to select the criteria relevant to their buildings and choose the products that fit their particular objectives. EPDs are not intended for comparing "better" or "worse" products, but to provide a record of the respective product characteristics. Which characteristic is then finally utilised in the building frequently depends upon the criteria specific to the user and the construction.

For instance, the energy utilisation or CO_2 emission of a floor covering only have a small impact on the energy consumption or CO_2 emissions of the building as a whole during its lifetime, since the decisive factors here are the heating systems and insulation. On the other hand, floor coverings as well as adhesives and auxiliary materials can have a determining influence on the indoor air quality on account of their emission behaviour.

We are the first manufacturer of resilient floor coverings to publish its own EPDs for its leading products. They are available in German and English, as well as in France in a modified form of the NF P 01-010 standard.

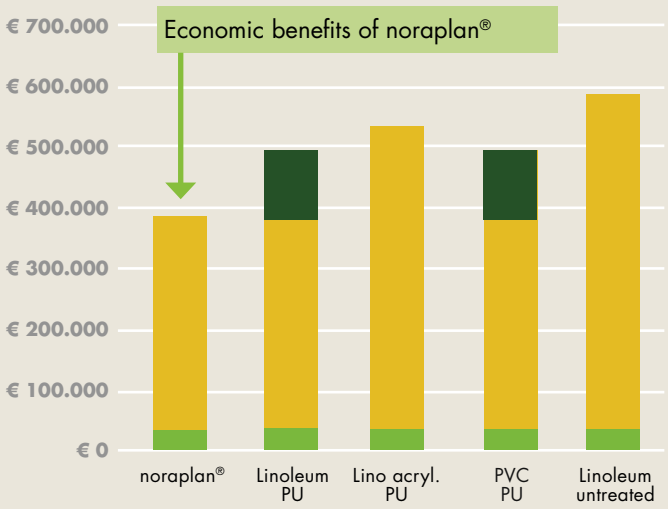

Manufacturers + IBU + experts
Compilation of the Product Category Rules
COMMITTEE OF EXPERTS
from the world of science, the FMTBUD, the Federal Environmental Agency, test institutes and other experts. It checks the consistency of the standardisation, stipulates uniform frameworks for all products, and specifies what records are required.
Internet forum
The IBU involves planners, construction professionals, interest groups, environmental and consumer associations, trade members and final customers, etc.
Product Group Rules (PGR)
The product group rules approved by the SVA define the stipulations for drafting the actual environmental product declaration.
+ Manufacturer
Product characteristics/ technical quality
+ Life cycle assessor
Life cycle assessment
+ Test institutes
Records, test certificates
Independent testing
of completeness, plausibility and data quality by an independent third party, confirmed by the IBU.

LIFE CYCLE COSTS

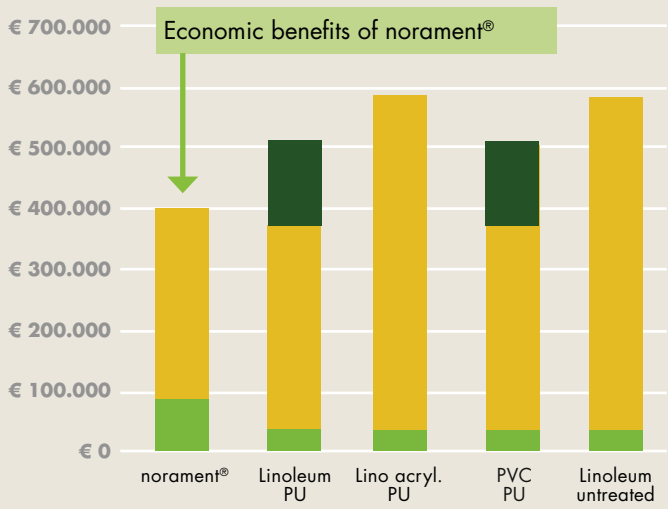
Economic efficiency comparison of nora® rubber floor coverings, linoleum and PVC.

Would you like to receive further information on individual life cycle costs? If so, please contact our responsible staff.

LCC COMPARISON: noraplan®



LCC COMPARISON: norament®



1,000 m², calculation for 15 years — Investment — Operating and maintenance costs — Surface refurbishment costs

Assumed cleaning scenario for an area of 1,000 m² over 15 years; details and source: nora® systems GmbH.
noraplan®: Typical hospital scenario, norament®: Areas with high levels of dirt contamination and mechanical strain.

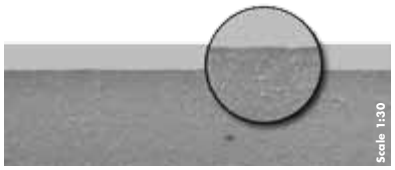
FIRE BEHAVIOUR

nora® floor coverings fulfil common requirements for fire safety and are (apart from a few function-related exceptions) flame-retardant according to EN 13 501, Part 1 and DIN 4102.
nora® floor coverings do not contain any PVC, plasticizers (phthalates) or halogens (e.g. chlorine). The absence of PVC ensures that no hydrogen chloride gas is released in the event of fire. This can lead to acid vapour burns of the respiratory tract as it reacts with the extinguishing water to form corrosive hydrochloric acid.
No toxic halogenated dioxins or furans are produced as the result of fire either. Such secondary damage caused by the combustion of PVC is often more severe in buildings than the fire damage itself.
nora® rubber floor coverings are rated as being fire-toxicologically safe. This means that the fumes created during a fire do not contain any harmful toxic gases. We also offer an extremely flame-retardant and low-smoke special covering for critical areas of application where fire is a concern.
Furthermore, we offer special fire prevention qualities that meet the need for non-combustible building materials.

SURFACE DURABILITY

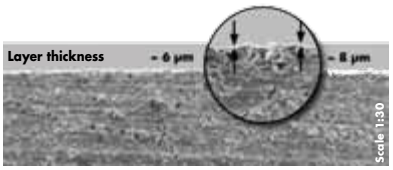
nora® floor coverings made of rubber have an extremely compact and impervious surface from the very outset that is achieved with nora cleanguard®, a post-curing method applied at the factory. nora® is rubber through and through: no coatings, no wearing layer. Comparisons of the cross sections of differing types of floor covering photographed under a scanning electron microscope (SEM) clearly show the difference:

Fig. 1:
Cross-section noraplan®
(without layer)



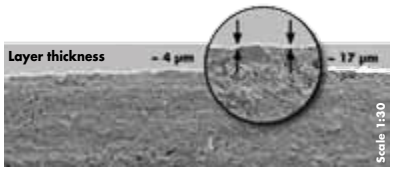
Section 1:100

Fig. 2:
Cross-section PVC
with PU surface



Section 1:100

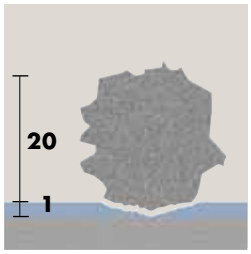
Fig. 3:
Cross-section linoleum
with PU surface



Section 1:100

However, PU surfaces (the white layer in Figs. 2 and 3) are just a few micrometers thick and have a limited service life.

$1\ \mu m = \frac{1}{1000}\ mm$



In comparison: dirt particles, such as grains of sand, are up to 20 times larger than coated PU surfaces and can quickly corrode them.

Advantages:

- no formation of pathways
- no increased accumulation of dirt with worn-out coatings
- no chipping, scratches or discolouration of the coating
- no expensive and time-consuming refurbishment of the surface
- easy to clean
- no disposal problems for cleaners after basic cleaning
- no application of new coatings with long drying times of 8–12 hours
- no downtimes due to screening off individual areas
- do not contain PVC, plasticizers (phthalates) or halogens (e.g. chlorine)
- ergonomic properties – greater walking comfort

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