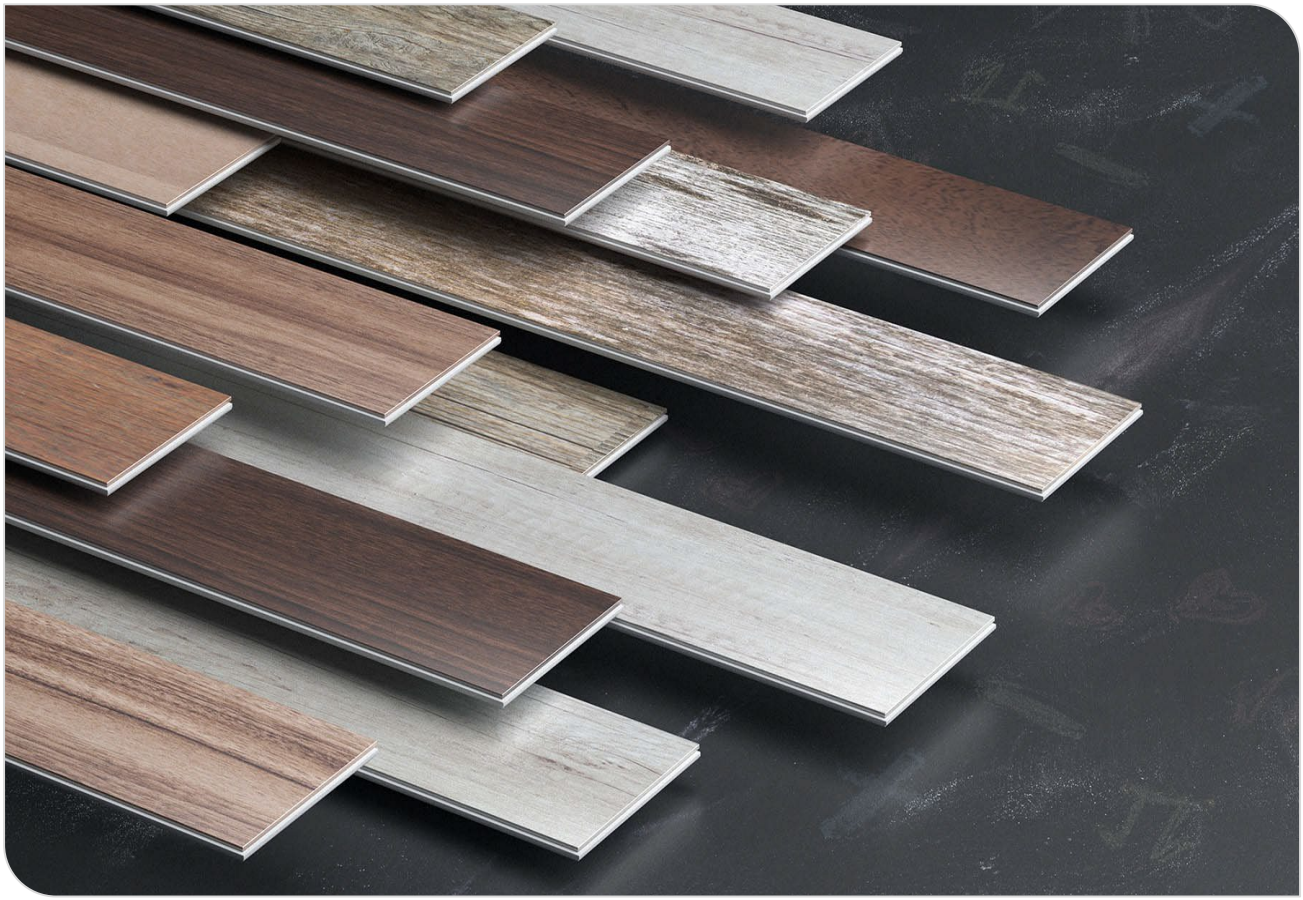
About Nordic Swan Ecolabelled

Floor coverings and flooring underlays



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Nordic Ecolabelling

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In 1989, the Nordic Council of Ministers decided to introduce a voluntary official ecolabel, the Nordic Swan Ecolabel. These organisations/companies operate the Nordic Ecolabelling system on behalf of their own country's government. For more information, see the websites:

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What is a Nordic Swan Ecolabel Floor covering and flooring underlay?

Nordic Swan Ecolabel floor coverings and flooring underlays have a reduced environmental impact as they contain a high share of responsibly sourced renewable and/or recycled materials, saving resources. Moreover, the production must be energy efficient to decrease its effect on the climate.

To be resource efficient, the products must demonstrate good quality performance and a long service life. To minimize the product's impact on health, strict requirements are set on the chemicals used in production and on emissions released to the indoor environment. Finally, requirements on quality, traceability, repairability and recyclability help promote circular economy.

A Nordic Swan Ecolabel floor covering or flooring underlay:

- Is made of a high share of renewable and/or recycled materials.
- Has responsible sourced renewable raw materials, through requirements for traceability and a high share of certified wood raw material.
- Comply with tough requirements relating to chemicals that are harmful to environment and/or health, including a ban on phthalates, halogenated flame retardants, PFAS and identified and potential endocrine disruptors on up-to-date lists from EU and national authorities.
- Meets ambitious requirements for energy efficient manufacturing, an important contribution to reduced climate impact.
- Meets requirements for emissions of formaldehyde and VOC to ensure a safe indoor environment.
- Is quality and performance tested and verified to guarantee a long lifespan. A 5-year warranty must be provided.
- Is traceable to the manufacturer to ensure reparability and/or recyclability.
- Fulfils all requirements for materials in Nordic Swan Ecolabel new buildings and renovations.

1 Summary

The Nordic Swan Ecolabel criteria for floor coverings and flooring underlays have been revised and updated to generation 7. The structure of the criteria has been changed and textile floor coverings have been moved to a new separate criteria document. This type of product is, therefore, not part of the revision. Flooring underlays have been added to the criteria's scope, hence the change of name.

Nordic Swan Ecolabel Floor coverings and flooring underlays have reduced environmental impact as they must contain a high share of sustainably sourced

renewable materials or, a high share of recycled materials, or combination of thereof, allowing natural resources savings. Moreover, the production of Nordic Swan Ecolabelled Floor coverings and flooring underlays must be performed in an energy-efficient way decreasing their contribution to climate change. Nordic Swan Ecolabel Floor coverings and flooring underlays have good performance and a long service life which further decreases the need of extracting/harvesting raw materials. To minimize the product's health strict requirements are set on the chemicals used during their production and on the level of emissions released to the indoor environment. Finally, requirements set on chemicals contained in recycled materials as well as requirements on traceability, reparability and recyclability make the products more aligned with the concept of circular economy.

Updated material requirements

The extraction of renewable can have major effects on the environment, especially on biodiversity and on landscapes. The requirement on the use of certified virgin renewable materials and documented recycled materials has been tightened in the draft of the new criteria. New requirement has been introduced for responsible sourcing of renewable materials used in the production of polymers contained in plastic, rubber and foam materials. At the same time, the requirements for minimum share of renewable materials or, share of recycled materials, or combination of thereof has been tightened.

Updated chemical requirements

The requirements on the production chemicals have also been tightened as the vast majority of substances classified as CMR are excluded. Furthermore, a number of substances or group of substances have been added to the list of forbidden substances and must neither be used in chemical products nor as additives in materials (notably, endocrine disruptors and PFAS). Finally, to ensure that the products contribute to a safe indoor environment, the requirement on emissions of VOC, SVOC, formaldehyde as well as CMRs (category 1A and 1B) has been tightened and updated to match the draft published by the European Commission on EU Taxonomy.

Updated energy requirements

Overall reduced energy consumption, the use of renewable sources and energy-efficient production are important parameters to reduce the emission of greenhouse gases, highly contributing to climate change. Therefore, a requirement on energy management has been implemented and the energy consumption requirement has been tightened. Moreover, the energy consumed for several additional processes occurring during manufacture must be now included in the calculation of the latter. Finally, the production of raw materials uses also significant quantities of natural resources. That is why, the energy consumption requirement covers also the energy consumed during manufacture of the main binders in plastic and hybrid floorings.

Updated circular requirements

Several requirements have also been either updated or added to increase the circularity of Nordic Ecolabelled floor covering and flooring underlays. The quality and durability requirements, ensuring that the products have a long

service life, and the product information requirement, making sure that all relevant information on how to extend the service life or how to handle the products once they have reached their end-of-use, have been updated. Requirements on products traceability, reparability and recyclability have been added to help manufacturers setting in place the first processes before having a fully operational take back system. Furthermore, strict chemicals requirements set on recycled materials contained in the products and a requirement on packaging, also contribute to eliminate the concept of waste, one of the pillars of circular economy.

Changes compared to previous generation

As in the previous version of the criteria, Nordic Swan Ecolabelled products must meet the requirements of the Construction Products Regulation (EU/305/2011) in relation to the documentation of the properties and functions with which the product is marketed. New in the criteria is a set of requirements entitled "Innovation requirements" and having for purpose to reward manufacturers that have come further in their sustainability work, and especially further that Nordic Ecolabelling's requirement in some areas or phases of the products' life cycle.

For a full description of the changes in the revised generation 7, see the table in chapter 6.

Nordic Swan Ecolabelled floor coverings and flooring underlays

Nordic Swan Ecolabelled Floor coverings and flooring underlays have reduced environmental impact as they must contain a high share of sustainably sourced renewable materials and/or a high share of recycled materials, allowing natural resources savings. Moreover, the production of Nordic Swan Ecolabelled Floor coverings and flooring underlays must be performed in an energy-efficient way decreasing their contribution to climate change. The products have good performance and a long service life which further decreases the need of extracting/harvesting raw materials. To minimize the product's health impact, strict requirements are set on the chemicals used during their production and on the level of emissions released to the indoor environment. Finally, requirements on products traceability, reparability and recyclability make the products more aligned with the concept of circular economy.

A Nordic Swan Ecolabelled floor covering or flooring underlay means:

- The products must contain a high share of renewable and/or recycled materials.
- Installation waste of linoleum and plastic flooring must be recycled. Products other than wood floor coverings must be recyclable.
- Reparability for all floor coverings must be ensured. Traceability between not glue down products and the manufacturer must be guaranteed.
- The renewable raw materials must be sustainably sourced, through requirements for traceability and a high share of certified wood raw material must be guaranteed.

- Chemicals used in production such adhesives and surface treatments must have a good environmental and health profile. For instance, endocrine disruptors, phthalates, halogenated flame retardants and PFAS must not be added to the products.

- The manufacturer must work continuously on an energy optimisation strategy and the product must be manufactured in an energy efficient way.

- Emissions of formaldehyde and VOC from relevant chemicals, from the final product must be low to ensure a safe indoor environment.

- The product's quality and performance must be tested so it can fulfil its function through its long service life. A 5-years warranty must be provided.

- Fulfil all requirements for materials in the criteria for Swan labelling of buildings and renovations.

2 Environmental impact of Floor coverings and flooring underlays

The criteria include very heterogenous products in terms of materials as they cover, among others, wooden flooring, bamboo flooring, linoleum flooring, laminate flooring and plastic flooring. The same remark can be made regarding underlays, which is the newly included product type covered by the 7th generation of the criteria.

Despite the differences between the used materials, the main environmental impact of floor coverings and underlays are the same for all types and comes from the extraction/cultivation and the production of the materials themselves;[1] that is, mainly, wood-based materials, linoleum and plastics/polymers.[2] However, floor coverings and underlays of good quality/materials have longer lifespan, decreasing the contribution that the raw material stage has in the product's overall environmental impact. Consequently, the impacts from the use stage becomes more significant, making the basis for good indoor climate (low emissions) and, for instance, the use of recommended cleaning and maintenance methods crucial aspects.[3]

Resource use, chemicals hazardous to the health and the environment, energy consumption, carbon footprint and biodiversity loss have all been identified as direct environmental impacts associated with this product group. Production of floor coverings is an energy-intensive process and is linked to the emissions of substances that are harmful to health and the environment, as adhesives may be required in the construction of the products and the application of a surface treatment is performed. The use of recycled materials has a direct positive effect as it reduces the quantity of virgin materials and flooring/underlays produced. To a higher extent, the same claim can be made if used floor coverings/underlays are

[1] https://susproc.jrc.ec.europa.eu/product-bureau//sites/default/files/contentype/product_group_documents/1581685016/Preliminary%20report%20sept%202014_revLCE_AB.pdf
[2] Feasibility study of wall and floor coverings with a view to establishing EU eco-labelling criteria, 2000
[3] Jönsson, Å. Including the use phase in LCA of Flooring Coverings, 1999

recovered, reused and recycled instead of being incinerated, which remains their prevalent way of disposal in the Nordic countries. Environmental costly resources can be spared, and material loops kept tight. Ensuring that both recycling fractions and virgin materials used in the manufacturing of the floor covering/underlays do not contain any harmful chemicals is key to promote recycling and further reducing the product's environmental impact in all stages.

See more details regarding the environmental impact of floor coverings/underlays in the MECO and RPS analyses. The purpose of the analyses has not been to rank the different flooring types or underlays materials in relation to each other, but instead to define the important environmental parameters for the different types of products. More details about the contribution of Nordic Swan Ecolabelled floor coverings and flooring underlays to circular economy can be found in the section bearing the same name. Likewise, more information on how these criteria can help opposing climate change and biodiversity loss is given in the next sections. Finally, the section UN Sustainable Development Goals shows how Nordic Swan Ecolabelled floor coverings can related to the various goals.

2.1 Qualitative MECO analysis

The relevant environmental impacts found in the life cycle of each of the flooring types (e.g., wooden, bamboo, linoleum and plastic) and flooring underlays types are set out in the qualitative MECO table below. A MECO describes the key areas that have impact on the environment and health throughout the life cycle of the product – including consumption of materials/resources (M), energy (E), chemicals (C) and other impact areas (O).

A relevant functional unit would be 1 m^2 flooring, with the possibility to include underlays, for an average product lifetime of 20 years, including installation and maintenance. But because of the lack of recent and harmonised data from LCA studies for all materials, it has not been possible to perform a full quantitative MECO analysis. Furthermore, very different materials and combinations thereof can be used in a floor covering or underlays. That is why, it has been assessed that a qualitative MECO is better suited for that particular product group.

The performed MECO analysis is made for floor coverings and flooring underlays included in the product group definition.

Qualitative MECO matrix for the life cycle of floor coverings and underlays.

	Raw material stage	**Production**	**Use stage**	**End-of-use stage**
Raw materials/ inputs	Wooden floors (solid wood, parquet, laminate, cork and bamboo floorings) and corkment underlays: Land use through deforestation, use of primary raw materials (wood, wooden panels, cork bark and bamboo). Use of endangered tree species. Seldom use of secondary raw materials in the manufacture of wood flooring or HDF included in laminate floorings.	Recycled/reused raw materials can be used in the manufacture of plastic and wooden flooring. Energy resources for production. Emissions to air and water during production.	Adhesives to install the flooring. Underlayment to improve the performance of the flooring. Refurbish with new surface treatment) (maintenance). Floor coverings have a long lifespan. The thickness of the wooden floor's top	Worn out floorings and underlays are mostly incinerated (energy recovery) in the Nordic countries. However, possibilities to reuse wood from solid wood flooring exist. Possibility for material recycling for laminate flooring, plastic and linoleum floorings (production waste,

	Adhesives, fillers, resins and surface treatments (biocides, paint and varnishes). Energy resources for cultivation, harvesting and use of biocides/pesticides. Water for cultivation. Energy resources for production and emissions during production. Linoleum: Land use through deforestation, use of primary raw materials (jute, linseed oil, rosin, limestone, wood flour, cork flour, pigment, surface treatment and sometimes flame retardants. Use of secondary raw materials such as recycled linoleum. Surface treatments. Energy resources for cultivation, harvesting and use of fertilizer/pesticides. Water for cultivation. Energy resources for production and emissions during production. Plastic flooring and underlays: Fossil-based polyolefins and/or other polymers. Use of secondary materials such as recycled PVB or other polymers from various material loops. Bio-based plastics. Mineral fillers, pigments, additives and surface treatments. Land use for crude oil and/or land use through deforestation for cultivation. Energy resources for cultivation, harvesting and fertilizer/pesticides. Water for cultivation. Pre-consumer recycling material can re-enter the manufacturing process. Energy resources for production. Emissions during production.		layer is decisive for how many times the floor can be sanded during the use phase and thus its lifespan. Floorings with durable/modern surface treatment require less maintenance and have longer lifespan. Chemicals needed for refurbishment/coating of the surface layer after sanding (plastic, linoleum and wood flooring). Chemicals needed for cleaning and maintenance. Spare parts and individual tiles/planks to replace damaged ones for reparable loose-lay/adhesive-free flooring.	installation waste and worn-out flooring). Recycled material can be reused in the manufacturing process and converted to new flooring.
Energy	Wooden floors (including laminate) and corkment underlays: Energy resources used for felling, debarking, eventual boiling and sawing. Energy resources used to produce adhesives, fillers, resins and surface treatments. Linoleum: Energy resources to produce wood and cork flour, to produce jute and linseed oil. Energy resources to produce pigments (mostly TiO2) and surface treatments. Plastic flooring and underlays: Energy resources to produce polyolefins and/or other polymers (fossil based and bio-based) Energy resources to produce mineral fillers, pigments, additives and surface treatments.	Wooden floors: Energy resources used for sawing and drying. Energy resources for kraft paper, décor paper and HDF manufacturing, including impregnation. Energy resources for production of the flooring, including gluing and/or pressing/laminating, and surface treating. Linoleum: Energy resources to oxidise the mixture of linseed oil, tall oil and rosin. Energy resources for the	Energy for cleaning/maintenance of the flooring.	Possibility for secondary raw materials generated during wooden floor manufacturing to be energy recycled at the plant. Energy resources for material recycling (separating, cleaning drying, reprocessing). Energy recovery if incineration of the worn out flooring is performed.

		manufacturing (calendaring), drying, trimming and surface treatment of the flooring. Plastic: Energy resources for extruding, calendaring, pressing and surface treatment of the flooring (full manufacturing).		
Chemicals and emissions	Wooden floors (including laminate) and corkment underlays: Biocides/pesticides from wood treatments. Adhesives, fillers, resins and surface treatments. Linoleum: Pesticides/fertilizers for the cultivation of linseed and jute. Surface treatments. Plastic flooring and underlays: Pesticides/fertilizers for cultivation of raw materials for bio-based plastics. Emissions to air and water of various chemicals during raw material extraction and production depending on the plastics/polymers. Additives and surface treatments.	Wooden floors: Formaldehyde, melamine, phenol and isocyanates from adhesives and resins, especially in laminate floorings. Chemicals used for surface treatments. VOC/SVOC from the material, adhesive, resins and surface treatments. Emissions to air and water during production. Waste generation. Linoleum: Chemicals used for surface treatments. VOC/SVOC from the material and surface treatments. Emissions to air and water during production. Waste generation. Accelerators used during manufacturing. Plastic: Chemicals used for surface treatments. VOC/SVOC from the material and surface treatments. Emissions to air and water during production. Waste generation.	Emissions of formaldehyde and VOC/SVOC to indoor environment. Possible migration of antibacterial substances and/or nanomaterials from surface treatments Possible release of microplastic during maintenance of linoleum flooring. Possible migration of plastic additives from the flooring to indoor environment.	Risk of passing undesirable chemicals (adhesives, resins, biocides, additives, etc.) onwards in the lifecycle by recycling/reusing wood, wood panels, plastics or flooring materials. Incineration and landfilling of floorings should be prevented as much as possible to minimize their effect on the environment.
Other	Social and ethical challenges associated with working conditions in India/Bangladesh regarding cultivation of Jute. Impact on biodiversity through land use and deforestation. Use of endangered tree species.	Production of flooring can occur in other parts of the world than Europe.	The use of underlays can improve the performance and the lifespan of the flooring. Installation of the flooring can be physically demanding and may involve a	Quantity and type of adhesive can hinder recirculation of worn-out flooring. Floorings have long lifespan and old ones may contain harmful chemicals.

			health risk for the installer. Adhesives with better health and environmental profile can be chosen.	Possibility to implement fully functional take-back systems in the future. Labelling and traceability of floor coverings are important aspects.

Summary of the most important environmental impacts found in the MECO analysis

The hotspots, or stages and processes in the product's life cycle that have a high environmental impact, identified during the MECO analysis can be found below.

The raw material stage:

Raw materials can be either of renewable sources or are of fossil origin. Wood is the most used material and is included in the manufacture of solid wood, parquet and wood-based panels (part of a laminate flooring). However, other plant-based materials are also widely employed as they are the main ingredients in linoleum, cork and bamboo flooring and corkment underlays. Bio-based/bio-attributed plastics, and even bioplastics (where the building blocks themselves come directly from fermentation or other natural process) can also be used. Production of the necessary renewable materials have a significant impact on the environment. Indeed, loss of biodiversity through using endangered tree species as well as through deforestation and land use are direct consequences.

Plastics of fossil origin are though much often used as they are more available and consequently cheaper. Secondary raw materials such as recycled plastics and materials can also be found in floor coverings and flooring underlays. Recycled plastics and especially polyolefins can be used as raw materials while post-production and pre-consumer recycling flooring material can re-enter the manufacturing process with the help of waste minimising actions or take-back systems. However, secondary wood-based raw materials, such as wood chips in HDF or reused wood, are rather used for their energy content (incineration for energy recovery or biogas production) than contained in laminate or solid wood flooring respectively.

Chemicals used during the manufacturing of flooring are usually of fossil origins. Though, natural adhesives made from organic sources are becoming more available. Many different chemicals and chemical products must be manufactured and be used in the production of floor covering and underlays. Adhesives, fillers, resins, accelerators and other additives, as well as surface treatments give the material or the final product its desired properties.

Consumption of various energy raw materials has also been linked to both the raw material and the production stages. There are no specific energy raw materials here that should be highlighted, as it will depend on the available energy sources where the processes take place. The quantity of water used to produce the different raw materials, especially those coming from renewable sources, is also an important aspect to consider.

The production stage:

The main environmental impacts caused in this life cycle stage are due to the energy consumption in the manufacturing stage of floor coverings and flooring underlays.

Regarding wooden floorings, there are a certain number of common steps in every production process such as drying and sawing that are considered high energy intensive processes. The freshly produced and calendared Linoleum must also be stored and dried until it has fully cured. The manufacture of plastic flooring requires that ingredients are firstly extruded to produce a malleable material. The material is then calendared and pressed to obtain its desired shape and characteristics. Energy consumption for the application of surface treatment, the production of chemicals, raw materials and bought-out parts (e.g., HDF and backing layer) used in the manufacturing of flooring can also be of significance.

The production stage is also where most of the harmful emissions take place and generate a non-negligible amount of waste. Especially in the case of the production of MDF/HDF (included in laminate and other hybrid floorings) that causes emissions of total particulate matter/dust from dryers, consisting of wood dust and condensable organic compounds and emissions of non-condensable natural VOC, including formaldehyde. Another source of VOC/SVOC and harmful chemicals to health and the environment is the application of a surface treatment or finish at the end of the flooring manufacturing process.

The use stage:

As the raw material and production stages have high environmental impacts, it is important that the materials used are of good quality and that the floor covering, or flooring underlays has a long lifespan. The floor covering must perform accordingly to the requirements stated by the area of use so its service life can at least be 20 years. The use of underlays can extend the floor covering's service life as well as improve the user experience (e.g., sound dampening, walking comfort).

Loose-laid flooring or floorings installed without the use of adhesives, have the advantage to be more easily reparable. Floor coverings based on click-systems allow the user to the change the damage plank or tile more easily.

Installing a floor can be physically demanding for the workers and it is important to choose adhesives that can both perform in the best way possible and have good health and environmental profile. Furthermore, the longer the service life is, the higher the contribution from the use phase from a product's life cycle becomes in relation to its overall health and environmental impacts. That is why adhesive, formaldehyde-based resins/glues, surface treatments as well as the materials the flooring is made of must be chosen so they do not negatively affect indoor environment by releasing too much VOC/SVOC.

A long service life means more chemicals used for cleaning and maintenance over the years. At the same time, it is worth noticing that certain chemicals and machines used for cleaning can contribute to the release of microplastics. Finally, antibacterial substances or nanomaterials from surface treatments as well as

various plastic additives can potentially migrate from the product to the indoor environment.

The end-of-use stage:

Loose-laid or adhesive-free installed floorings can be designed for repair and damage tiles or planks can be easily replaced, making the products overall more circular. In the case of glued-down flooring, the type and quantity of adhesive may hinder treatment of old flooring and consequently material recycling and recirculation.

Wood, linoleum and plastic flooring can be sanded, and a new coating can be applied afterwards. Refurbishment/renovation/repair/reuse are processes with low environmental impact and should be promoted and preferred over material recycling and of course production of new virgin material and product.

All the materials used for manufacturing floor coverings and flooring underlays are characterized by having high energy content and/or being considered as CO_2 storage. Landfilling or incineration without energy recovery must be prevented, also because of the emissions/migration of chemicals occurring during these processes.

Recycling uses less energy than that required to manufacture virgin materials. The use of reused/recycled raw materials reduce drastically the overall resource consumption associated to floor coverings/underlays manufacturing. Reused wood, recycled plastics, recycled wood-based materials can re-enter the manufacturing process and be used instead of virgin materials. That is why, it is of uttermost importance that the recycled fractions are of good quality and do not contain undesirable or legacy chemicals as remains from previous material uses.

Waste generated during manufacturing can either be used because of its high energy content (wood-based waste can be used as fuel in combustion plants) or be reused as input in the process (post-production waste in plastic and linoleum flooring production). Pre-consumer or post-installation waste (10% of the flooring becomes scraps during installation[4]) can also be reused instead of virgin materials and become new flooring. Post-consumer flooring/underlays material is still scarcely used as input in the manufacturing of new products as many parameters must be considered. As of today, and for compatibility reasons, flooring manufacturers are able to reuse in the production of new floor coverings only post-consumer recycled flooring material that they selves manufactured in the first place; hence the current need for manufacturer-specific take-back system over systems managed by industry associations.

To ensure flooring and underlays manufacturers the access to post-consumer recycled material of good quality and purity, actions can be taken to put a take-back system in place. The way to a fully operational take-back system includes several steps, each of them being associated with issues. These issues are responsible for the relatively low manufacturers' steerability in managing to recover their own products once they have reached their end-of-use. However, some of these issues can be addressed by the manufacturers so that the chance the product finds its way back increases, no matter the number of actors involved

[4] https://www.golvbranschen.se/miljo-hallbarhet/golvatervinning-for-installationsspill/

along its service life. For instance, working with materials that are recyclable and developing in-house processes enabling recycling of these could be seen as a first important pillar. As a matter of fact, flooring comprising many different materials, as for instance laminate flooring, are much more difficult to recycle compared to floorings of more homogeneous composition (e.g., plastic and linoleum floorings).

2.2 RPS analysis

Nordic Ecolabelling sets requirements on the stages and processes in the product's life cycle that have a high environmental impact – also called hotspots. A tool called RPS is used to identify where ecolabelling can have the greatest impact. R stands for relevance and identifies the environmental issues; P stands for potential and lists the area where the product's environmental impact can be reduced, and S is for steerability, meaning the possibility to set requirements that can be documented and followed up.

The objective of Nordic Ecolabelling is to steer the industry towards the environmentally best flooring or underlays within each of the different product or material types. That is why, it has been assessed that requirements can be set at the different stages of a floor coverings or flooring underlays' life cycle and environmental gain can be achieved by fulfilling all criteria, no matter the materials used. The table below provides an overview of the key areas where requirements are pertinent, beneficial and applicable due to a high or medium RPS.

Table 1: Summary of results of the RPS analysis.

Lifecycle stages	Area and assessment of R, P, S (high, medium or low)	Comments
Raw materials		
Wooden floors (wood, bamboo, cork and laminate floorings, as well as engineered wood floorings, design wood floorings and hybrid floorings containing high proportion of wood-based materials) and underlays made mostly of wood-based materials.	**Resources – wood raw materials** R: High P: High S: High	Wood raw materials used in floorings have a high RPS. From a life cycle perspective, forestry is a key part of wood products' environmental impact, and it is also important that wood as a renewable raw material is grown / harvested and used in a sustainable way. Much of the world´s forest loss is driven by conversion of natural forest to other land uses such as cattle farming, palm oil and soy plantations. Deforestation and degradation from illegal and unsustainable logging, fires and fuelwood harvesting can harm wildlife, jeopardize people´s livelihoods and intensify climate change. Credible forest management certification contributes to a more sustainable wood / timber product industry by helping create market conditions that support forest conservation. Requirements for high share of certified wood raw materials and certified traceability ensures more sustainable forestry.
Linoleum floors, Hybrid flooring and underlays containing other raw materials than the most common ones.	**Resources – other raw materials** R: High P: Medium S: Medium/Low	The individual plant used to produce the natural fibre, or any other renewable raw material must be obtained in the least environmentally impactful way. However, the products in this product group are expected to include relatively low amount of textile fibres. Only flax and other bast fibres are expected to be extensively represented in flooring because of their use in linoleum floorings. That is why, specific requirements

		on biocides use and on COD/TOC values have been specifically set. The supply chain being very long from the cultivation to the production of the final flooring and the relatively low impact of the fibre types used in this product group are responsible for the medium potential and low steerability. Furthermore, a multitude of raw materials can be used in hybrid floorings or underlays. Hence, it is required that other raw materials may be used only if they are residual products from processes or 100% pre/post-recycled material. Full traceability must be guaranteed.
Plastic floorings, floorings containing WPC, floorings containing rubber and/or foam materials and plastic-based underlays	**Resources – Virgin fossil plastic raw materials and plastics produced from renewable raw materials** R: High P: High S: High	The production of plastics and polymers is highly energy and resource demanding. However, it is troublesome to obtain relevant energy consumption and other resource consumption related to the production of specific plastic/polymer types. Instead, a requirement is set demanding that plastic flooring/underlays must contain a high share of recycled and/or renewable materials. Additional requirements are set on the additives added to the plastic/polymer material as it is known that some of them are classified as hazardous which may affect indoor environment under the use phase and hampers the recirculation/recycling of the material once the product has reached its end of life. Regarding, bio-based plastics/polymers used in underlays/floorings, requirements may be set depending on the raw material used. Plastics/polymers produced from of waste or residual products defined in accordance with (EU) Renewable Energy Directive 2018/2001 are preferred over virgin bio-based plastics and obviously virgin fossil-based plastics and polymers. Specific requirements on composite material have been set to minimise the material environmental impact and to ensure that composite-containing floorings meet the most stringent limit values.
All flooring types	**Resources - recycled raw materials** R: High P: Medium/High S: Medium/High	Use of recovered and recycled materials such as renewable fibres/materials, plastics or even flooring materials will reduce the negative environmental impact of all types of underlays/floorings. Requirements that linoleum, plastic and other type of floorings except wood-based floorings must contain recycled materials will reduce the need for virgin raw materials and thus save natural resources. The potential for using recycled materials is relatively low in wood-based products, often because of how a flooring product is constructed/produced but also because wood may be requested by the energy sector. A challenge of using recycled materials can be the content of harmful substances. Recycled wood raw materials therefor need to be tested to reduce the spread of substances of concern and promote the potential of material reuse in the future. The traceability for recycled wood materials is high due to widespread certification schemes. Recycled polymers/plastics, foam and rubber as well as recycled leather and fibres must also be tested for hazardous chemicals deemed as most relevant for this product group.
Floorings and underlays production		
All product types	**Energy - Production** R: High	High RPS has been identified for energy consumption and its contribution to climate change during the production of floorings and underlays. Working on having

	P: High S: High	a more energy-efficient production, reducing overall energy consumption and increasing the use of renewable energy and fuel play an important role in minimising the product's overall environmental impact. Energy consumption during production of the materials necessary in the product's construction has also been identified as having high RPS. This concerns wood-layers, plastic binders, HDF, linoleum cement and any other main material used in the product. Both energy consumption during the production of the final product and during the production of materials are included in a requirement with limit values that shall not be exceeded. However, steerability to reduce energy consumption for producing chemicals used during the manufacture of floorings and underlays (e.g., adhesives and surface treatments) was identified as low. This, because of the lack of data and the high number of different chemicals that may be used. That is why, it has been left out from the energy consumption requirement.
All product types	**Waste - Production** R: Medium P: Medium S: Medium	Minimization waste production ensures an efficient use of resources (energy and material), enables resource savings and contributes to increase the circularity of the product. Wood dust is produced during the manufacture of wood-based flooring that can be used as renewable fuel. The production of linoleum and plastic flooring generates waste that can re-enter the process and become new floorings. A requirement is set so that all production waste must be either energy recovered or reused and reprocessed according to the good practices. Such requirement can be met easier if a waste minimization management programme is implemented.
All product types	**Chemicals - Production** R: High P: High S: High	Reducing the quantity of health and environmental harmful chemicals and substances used during the production of floorings and underlays has high RPS. However, steerability lowers once one gets further away from the manufacture of the main raw materials and of the final product. SVHC, substances assessed as PBT/vPvB and/or listed as endocrine disruptors can be found in various chemical products. Chemical products such as adhesives, resins and surface treatments can be a source of phthalates, PFAS, chlorinated paraffins biocides, nanomaterials and VOCs such as formaldehyde, among others. Requirements can be set so that a wide range of hazardous substances is excluded, does not migrate or is emitted during the use phase, and does not pollute or contaminate during the end-of-life phase. For instance, application technologies leading to the least VOC emissions are encouraged. Potential and steerability also exist for requirements set at the production stage to limit emissions to air and water. Especially in the case of laminate floors manufacturing. These requirements ensure that both end-users and workers are exposed to as little harmful chemicals as possible.
All product types	**Packaging** R: Medium/Low P: High S: Medium	There is a relevance for plastic material used as packaging as they are produced from fossil feedstock. There is also relevance for paper and cardboard packaging as their production from wood fibres leads to deforestation and biodiversity loss.

		Requirement is set to promote the use of recyclable packaging/material to further reduce the products' environmental impact.
Use stage		
All product types	**Chemicals – Emissions** R: High P: High S: High	An overall high RPS has been found to set requirements on the emissions generated by the finished flooring and underlays. High indoor environment quality is very important from the consumer's point of view and that means that they must be protected from emissions of VOCs and CMRs substances, such as formaldehyde. Steerability lowers regarding chemicals used for installation, maintenance and cleaning. Adhesives, oil, levelling compounds and waxes (sometimes containing microplastics) must often be used. Manufacturers can only give recommendations on what chemicals should be used.
All product types	**Quality and durability** R: High P: High S: Medium	A high relevance and potential have been found to set requirements on the quality and durability of the floor covering. The longer the service life for a floor covering is, the less its environmental impact becomes. The consumption of chemicals, raw materials and energy is drastically reduced. High steerability is illustrated by the numerous continuously updated quality and durability standards/technical bulletins specific to the materials or type of flooring/underlays. These must be met to ensure that the product has a long lifespan. Once, the product has been installed, steerability gets lower. However, Information intended to extent the product service may be provided by the manufacturer and made easily available for flooring installers, consumer and cleaning services.
End-of-use stage		
All flooring types	**Circularity/recyclability – take-back systems** R: High P: High S: Low	High relevance and potential have been identified regarding setting requirements at the end-of-use stage to increase recycling of floorings and decrease their incineration. Steerability is however hampered by many parameters such as the choice of the material used in the floorings and their recyclability, the long service life of floorings and the lack of traceability between the installed products and the flooring manufacturers, as well as the numerous actors involved in the life cycle of floorings and the lack of communication between them. As a result, no flooring manufacturers have a fully operational take-back system for worn out floorings as of today. However, Flooring manufacturers have steerability in some cases: - Labelling and traceability can be ensured for some flooring types and in some product areas. - The choice of materials or installation (e.g., with or without adhesive) can facilitate recover and recycling of the floorings. - The services offered can be communicated to the customers. A requirement is set to ensure that all flooring manufacturers develop technologies enabling recycling of all their products, except for wood floorings. They must also offer to recover installation waste for their plastic and linoleum floor coverings. A requirement is set on product and consumer information stating that all services offered by the

		manufacturer with purpose to proper handle the product when it has reached its end-of-life must be communicated. Because steerability towards a fully operational take back system for used floor coverings is low to medium, it is also required that the products contain a high share of renewable and/or recycled materials to reduce its overall environmental impact.
All flooring types	**Reuse, Renovate and Repair** R: High P: High S: Medium/Low	High relevance and potential have been identified regarding setting requirements at the end-of-use stage to increase reuse, repair and renovate of floor coverings. These processes have the most beneficial benefits as they lead to the least depletion of natural resources, contribute less to climate change and generate less waste. To promote reuse and repair, requirements are set on the possibility to renovate/refurbish the flooring and on the possibility of disassembly and replace if the flooring can be installed without the use of permanent adhesives. Furthermore, a requirement on warranty ensures that the product must be reparable though out is service life. Once again, the product information requirement guarantees that all possibilities are communicated to the end-user. Finally, to increase the chance for renovate/repair, it is required that a maintenance plan is provided with the purchase of a floor covering. Hence, actions to renovate/repair the flooring can be planned with the different actors involved. Unfortunately, steerability remains low to medium as it is still up to the end-user to do the right thing and take actions to reuse/renovate/repair the product instead of buying anew.

2.3 Circular economy and Climate

The Nordic Swan Ecolabel is a good tool for companies working on adjusting their business models (and/or products) and willing to make the shift towards a more circular economy. Indeed, the entire product life cycle, including the phases known as raw materials extraction, production, use and end of-use (e.g., the 3 different scenarios, landfilling, incineration and recycling are considered) is scrutinised. This holistic approach enables the drawing of a bigger picture where all material loops involved in the manufacture of a product are considered. This step is crucial to pinpoint the areas or processes needing adjustments or corrections to be more in line with the concept of circular economy. These so-called hot spots related to circular economy may then serve as basis for the development of circular requirements found in a specific product group's criteria. More information about how the Nordic Swan Ecolabel generally contributes to a circular economy can be found on our website.

Actions taken to commit to the shift towards a more circular economy (through rendering the products more circular) are often closely related to actions taken to reduce the products' contribution to climate change. Therefore, requirements on Nordic Ecolabelling floor coverings and flooring underlays associated with these two aspects are described together below:

- The criteria promote sustainable forestry, protecting key habitats for biodiversity. Forest areas are known to play a role in regulating the climate.

- The criteria promote the use of sustainably harvested renewable materials as well as the use of pre-/post-consumer recycled materials of good quality and purity. This leads to a lesser need of using natural resources (e.g., energy, chemicals, materials and water) and especially a lesser need of extracting more oil to produce virgin fossil materials, highly contributor to climate change.

- The criteria promote the use of chemicals of less environmental and health impact and the production of materials, floor coverings and flooring underlays which do not contain the most hazardous substances. This allows recycling of the materials without the risk of recirculating, for instance, hazardous additives in plastics fractions. Furthermore, a specific requirement is set on recycled plastics so that they are not contaminated with, for example, halogenated flame retardants and heavy metals.

- The criteria promote the use of renewable fuel and energy sources. The energy management and consumption requirements are set so that the manufacturers work continuously on reducing their CO_2-emissions and consequently their general climate impact, as well as on manufacturing specific products in a more resource-efficient fashion. Furthermore, requirements on waste management and on recyclability have for purpose to promote recover/recycling of the waste generated during manufacture. As previously stated, the use of recycled materials further reduces the overall energy consumption and thus, the product's climate impact.

- The criteria promote products with long service life through requirements on quality and durability as well as on product/consumer information. Raw material extraction and product manufacture being the most environmental impactful steps, it is of uttermost importance that Nordic Ecolabelled products have a long service life.

- The criteria promote reuse/repair/renovate of floor coverings over the purchase of new products when this can be avoided. Requirements on reparability and warranty as well as on traceability and maintenance are part of an attempt to tackle overconsumption and reduce the product environmental impact.

- The criteria promote the development of a take back system. A take back system enables recycling of flooring materials and decrease drastically the need for production of new chemicals and materials and the overall need for resources employed during manufacture. Requirements on traceability and recyclability are set to increase the chance of recycling worn out floorings.

2.4 Biodiversity

Biodiversity is the variability of all living organisms on Earth and how they interact. Biodiversity or biological diversity is the variety and variability of life on Earth. Biodiversity is a measure of variation at the genetic (genetic variability),

species (species diversity), and ecosystem (ecosystem diversity) level.[5] Biodiversity plays an important role and is beneficial for society,[6] as demonstrated by the development of ecosystem services. These come in three flavours:

- Provisioning services which involve the production of renewable resources (e.g.: food, wood, fresh water),
- Regulating services which are those that lessen environmental change (e.g.: climate regulation, pest/disease control) and,
- Cultural services represent human value and enjoyment (e.g.: landscape aesthetics, cultural heritage, outdoor recreation and spiritual significance).[7]

In 2019 the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES) published its first global report, calling for transformative change. The world must bring biodiversity back into the production landscapes in addition to creating more protected areas. In 2022 the UN Convention on Biological Diversity[8] adopted the Kunming-Montreal Global Biodiversity Framework agreeing to conserve and manage at least 30 percent of the world's lands, inland waters, coastal areas and oceans.

Nordic Ecolabelling contributes to protect biodiversity by requiring that renewable raw materials are sustainably sourced and by promoting the use of waste/residues or recycled materials instead of virgin raw materials, thus, enabling natural resources savings. The goal is to counteract loss of species and deterioration of ecosystems, and that sourcing of biological raw materials is in balance with regeneration.

2.5 UN Sustainable Development Goals

Of all UN sustainable development goals, the one that the Nordic Swan Ecolabel contributes the most to is Goal 12, “Ensure sustainable consumption and production patterns”. Through setting requirements at the different phases of the lifecycle and especially on resource use, as well as on the chemicals and the materials included, the Nordic Swan Ecolabel commits to reduce the environmental impact associated with the production and consumption of goods. The same requirements enable control of the supply chain, ensures sustainable production and leads to the delivery of sustainable products to the end-user. The end-user can then safely use the products throughout their service life.

Nordic Swan Ecolabelled products are manufactured all over the world. Wherever the Nordic Swan Ecolabelled product is made, its manufacture must fulfil strict environmental requirements that go beyond the legislation in place. This promotes more environmentally-friendly production methods – in

[5] "What is biodiversity?" (PDF). United Nations Environment Programme, World Conservation Monitoring Centre.
[6] Cardinale, Bradley; et al. (2012). "Biodiversity loss and its impact on humanity" (PDF). Nature. **486** (7401): 59–67. Bibcode:2012Natur.486...59C. doi:10.1038/nature11148. PMID 22678280. S2CID 4333166
[7] Daniel, T. C.; et al. (21 May 2012). "Contributions of cultural services to the ecosystem services agenda". Proceedings of the National Academy of Sciences. **109** (23): 8812–8819. Bibcode:2012PNAS..109.8812D. doi:10.1073/pnas.1114773109. PMC 3384142. PMID 22615401.
[8] https://www.unep.org/un-biodiversity-conference-cop-15

developing countries too. The criteria for floor coverings and flooring underlays contribute to Goal 12 as follows:

- Requirements on the share of renewable and/or recycled raw materials. Especially requirements for certified sustainable wood raw material and their traceability. These requirements are for purpose to lower the product's overall environmental impact and consequently contribute to more sustainable production.

- Requirements on energy management and energy consumption during the products' manufacture. These requirements are directly linked to sustainable production.

- Requirements on harmful chemicals to health and to the environment reduce the emissions of undesirable substances during production, use and end-of-use phases, at the same time facilitating potential material recovery in the future.

- Requirements on quality, durability and product information to ensure long service life. These requirements enable efficient use of natural resources.

- Requirements on traceability, reparability and recyclability may further reduce the environmental impact associated to production and can drastically contribute to a more sustainable consumption.

Although Nordic Ecolabelling mainly contributes to Goal 12, Target 3.9 may also be addressed. Target 3.9 focuses on mortality due to environmental pollution. Comprehensive and strict requirements on chemicals all contribute to this target.

3 Other labelling schemes and management systems

3.1 EU Taxonomy

There are still some uncertainties on how EU Taxonomy compliance can be documented as well as interpreted. Therefore, Nordic Ecolabelling cannot guarantee alignment between EU Taxonomy's requirements and its requirements on Floor coverings and flooring underlays yet. Nordic Ecolabelling does not take any legal responsibility for the (degree of) alignment, nor can a Nordic Swan Ecolabel building material (or listed in the Supply Chain Declaration Portal) be claimed as taxonomy aligned based on the ecolabelling criteria. The responsibility for documentation of EU taxonomy compliance solely belongs to the company who is claiming it. Nordic Ecolabelling closely follow interpretations of the EU Taxonomy criteria in both the Nordic countries and from EU. In the end the interpretation is a task for national authorities or other officially appointed bodies.

However, when it comes the Delegated Act on the objective climate change mitigation (Commission Delegated Regulation (EU) 2021/2139 of 4 June 2021) the following issues have been handled in the criteria for Floor coverings and flooring underlays. Specifically, reference is made to the activity 7.1 "Construction of new buildings: 7.1.5.2: Pollution and prevention control", i.e.,

Building components and materials used in the construction that may come into contact with occupiers emit less than 0,06 mg of formaldehyde per m³ of test chamber air upon testing in accordance with the conditions specified in Annex XVII to Regulation (EC) No 1907/2006 and less than 0,001 mg of other categories 1A and 1B carcinogenic volatile organic compounds per m³ of test chamber air, upon testing in accordance with CEN/EN 16516 or ISO 16000-3:2011 or other equivalent standardised test conditions and determination methods.

This requirement is relevant for the criteria for Floor coverings and flooring underlays. The proposed requirement for formaldehyde emissions is harmonised with the EU Taxonomy requirement. Nordic Swan Ecolabelling is aware that the specified test conditions referred to in Annex XVII has not yet been published. As mentioned earlier, Nordic Ecolabelling is closely following the development and interpretations of the EU Taxonomy criteria in both the Nordic countries and from EU.

3.2 CE marking

As of 1 July 2013, all construction products covered by a harmonised standard or European Technical Assessment (ETA) must have a performance declaration and be CE marked in order to be sold in the EU. This is regulated by the EU Construction Products Regulation (305/2011/EU), abbreviated CPR. The purpose of the Construction Products Regulation is to ensure that reliable documentation on the performance of construction products is presented in a harmonised manner throughout the EU, so facilitating free trade. Common, harmonised European standards or European assessment documents (EAD) are used to test and report the product's performance. These serve as a basis for the CE marking of the construction product. Performance requirements are set by each member state, but there are also rules on restrictions in harmonised legislation such as REACH.

The harmonised product standard, EN 14041 "Resilient, textile and laminate floor coverings – Essential characteristics" covers flooring made from plastic, linoleum, cork, rubber and textile flooring There is an equivalent European harmonised product standard for wood flooring; EN 14342 "Wood flooring. Characteristics, evaluation of conformity and marking". This means that since 1 July 2013 these types of flooring must have a CE marking. These standards do not include flooring underlays.

It is worth noticing that the CPR is under revision and that Nordic Ecolabelling is closely following the work ongoing at the European Commission's level.

3.3 Other labelling schemes

Type I environmental certifications

The EU Ecolabel has criteria documents for wood-, cork and bamboo-based floor coverings (2017/176) and hard covering products (2021/476).

The German ecolabel Der Blaue Engel has criteria documents for low-emission floor coverings made of wood and wood-based materials (criteria document: DE-UZ 176), for resilient floor coverings (criteria document: DE-UZ 120), as well as for low-emission flooring underlays (criteria document DE-UZ 156).

EPD

Environmental Product Declarations (EPD) according to the standard ISO 14025 (environmental labelling and environmental declarations Type III) have been developed with the aim of showing a product's impact on the environment from a life cycle perspective.[9] Different EPDs need to be based on the same PCR (product category rules), for them to be comparable to each other. A PCR describes how the calculations for an EPD should be done within a specific product area/industry. PCRs and EPDs are produced and published by so-called program operators. Program operators are often active on a national level and many countries have their own program operator.[10]

Product-specific EPDs ("single-company"/"product specific" EPDs) are the most common type of EPD. They are designed for a specific product from a specific manufacturer. Many flooring manufacturers have published product specific EPDs. Industry-wide EPDs ("Sector"/"Industry Average" EPDs) represent an average for a specific industry or product type. These EPDs can be based on a weighted average of data or so-called “generic” data from the industry, that is, the dominant percentage of manufacturers.[11] This is common in the construction industry and in the context of the EN 15804 standard, an industry wide EPD is sometimes also "Generic EPD”. For instance, the trade association ERFMI (the European Resilient Floor Manufacturers Institute) has had an LCA carried out using data from ERFMI members which covered more than 85% of all European production of resilient. Output from this analysis is mainly used as input in an EPD calculator, where members can upload generic EPDs to their websites.

Cradle to Cradle (C2C)

The Cradle-to-Cradle Certified® Products Program began as a proprietary system; however, in 2012 the certification was turned over to an independent non-profit called the Cradle-to-Cradle Products Innovation Institute. The Cradle-to-Cradle Products Innovation Institute’s certification criteria from the latest version of the standard 4.0 are material health, product circularity, clean air and climate protection, water and soil stewardship and social fairness. The certification is available at several levels: bronze, silver, gold, platinum, with more stringent requirements at each. Recertification is required every three years and companies need to show measurable improvement to re-certify. Many construction products and notably floor coverings are certified according to the C2C product standard.

FSC/PEFC – raw material labelling

The forest certification schemes Forest Stewardship Council (FSC) and Promoting Sustainable Forest Management (PEFC) play a certain role in the flooring industry. According to the manufacturers, these raw material

[9] Naturvårdsverket. (den 26 10 2022). Beräkning enligt GHG Protocol eller ISO-standard. Hämtat från https://www.naturvardsverket.se/vagledning-och-stod/luft-och-klimat/berakna-klimatpaverkan/berakning-enligt-ghg-protocol-eller-iso-standard/
[10] IVL. (den 1 11 2022). Klimatanpassad och cirkulär upphandling. Hämtat från IVL: https://www.ivl.se/projektwebbar/klimatanpassad-och-cirkular-upphandling.html
[11] EPD International. (den 02 12 2022). Different EPD types. Hämtat från EPD - The international EPD System: https://www.environdec.com/all-about-epds/what-is-an-epd

labels/certification schemes do not compete directly with the Nordic Ecolabel on the Nordic market.

Environmental certification of buildings

There are many different systems for environmental classification of buildings used in the Nordic countries. The systems set requirements for construction materials, including flooring. For suppliers of construction materials to be included in the **LEED** (Leadership in Energy and Environmental Design) system, they must first be certified under the FloorScore system, which assesses the indoor climate performance of construction products.

The British **BREEAM** (Building Research Establishment Environmental Assessment Method) classification system requires a life cycle analysis as the basis of an Environmental Product Declaration (EPD) which is then included in BREEAM's "Green Book". BREEAM's Green Book acts as an online list of assessed products and services in the construction industry. The Norwegian version of BREEAM (**BREEAM-NOR**) sets criteria for selection of environmental hazardous substances which must not be included in construction products. In addition, emission criteria are set equivalent to the level M1 in the Finnish classification system Emission Classification of Building Materials.

The **DGNB** (German Sustainable Building Council) system in Denmark also sets environmental criteria for flooring, which includes evaluating the following substances contained: halogenated and partially halogenated fuels, heavy metals, biocides, Substances of Very High Concern and organic solvents and softeners. Level requirements are also set for the use of sustainable wood. DGNB does not set concrete emission requirements for construction materials, but does set requirements for good air quality in buildings via suitable amounts of ventilation and low emission materials. There is a focus on VOC and formaldehyde levels.

Assessments systems

There are several national registration systems and environmental assessment systems for construction products and construction materials which have a major impact on the market.

- BASTA Online, based on self-registration and self-declaration followed by sample audits by an independent third party.
- Byggvarubedömningen and Sunda Hus, which are environmental assessment/environmental evaluation systems for construction materials which manufacturers sign up to.
- ECOproduct, which is both an environmental evaluation method and a database of already evaluated products. An environmental product declaration (EPD) is used as the basis for evaluating the product. ECOproduct was developed in partnership between SINTEF Byggforsk, Norsk Byggtjeneste and NAL-Ecobox.
- There is also the electronic information system CoBuilder, which shows whether chemicals/products contain substances on the REACH Candidate List, the Norwegian priority list and BREEAM NOR's list of banned substances. CoBuilder also shows whether the products are Nordic Ecolabelled or not.

- Byggtjeneste-NOBB is another database for construction products which contains some environmental information.

4 Justification of the requirements

This section presents proposals for new and revised requirements and explains the background to the requirements and the chosen requirement levels. The changes carried out compared to generation 6 are listed more in details in chapter 6 Changes compared to previous version. The appendices referred to are those that appear in the criteria document “Nordic Swan Ecolabelling of Floor coverings and flooring underlays".

As previously described, the requirements written in this document are the result of an RPS analysis. The requirements are set on the steps and processes identified in the product’s life cycle as having the greatest environmental impacts and where Nordic Ecolabelling has sufficient steerability to demand pertinent and credible documentation. By doing so, Nordic Ecolabelling creates good ground for differentiating between products on the market based on their environmental profile.

4.1 Definition of the product group

Nordic Ecolabelling has chosen to limit the criteria to floor coverings intended for indoors used as well as to flooring underlays. Flooring underlays can be defined as a thin layer of either plates or rolled material installed under the floor covering to which they may or may not be attached or glued to. The purpose of the underlays is to enhance the properties of the installation and flooring construction (e.g., levelling out subfloor irregularities, support of the flooring click system, sound dampening and humidity barrier). Floor coverings and underlays must e.g., be able to be laid on a surface of concrete or timber boarding.

Floor coverings that can be Nordic Ecolabelled are:

- wooden floorings according to EN 13756, EN 13489 and EN 14354 (solid wood flooring, multi-layer wood flooring or engineered wood floorings and wood-based panels - wood veneer floor covering/rigid floor covering),
- cork floor covering (meaning both cork tile flooring according to EN 12104 and engineered cork flooring),
- bamboo flooring,
- laminate flooring as defined in standard EN 13329.

In addition to cork flooring, the following resilient flooring can be Nordic Ecolabelled according to these criteria:

- plastic flooring,
- linoleum flooring.

Hybrid flooring, which combines wood, laminate and resilient flooring can also be Nordic Ecolabelled if the materials can fulfil all relevant requirements. However, for hybrid floorings and other flooring types containing a layer made of *recycled* composite material, specific requirements must be fulfilled (see section 4.5.5).

A Nordic Ecolabelled floor covering that is marketed and sold as flooring for wet rooms must be approved for wet rooms.

Flooring underlays, depending on the materials they consist of, are not always products covered by a harmonised standard. Hence, it is not defined exactly which types of flooring underlays can be Nordic Ecolabelled. Flooring underlays must fulfil all relevant requirements to become Nordic Ecolabelled. Flooring underlays are added to the product group definition as a separate product type and may not be certified in combination with a floor covering.

The product group <u>does not include</u> the following products:

- Floor coverings and flooring underlays which contains > 5% of a type of material not included in section 4.5 Materials. This allows floor coverings and flooring underlays to contain a limited amount of materials for which there are no requirements.

- Textile flooring. They can be Nordic Ecolabelled according to the criteria for Carpets, floor rugs and floor mats*.

- Rubber flooring. However, it is allowed to use rubber as a material for instance in the intermediate or backing layer of the flooring.

- PVC/vinyl flooring as well as PVC as a material in flooring underlays. See requirement O5 for more information.

- Construction panels, including medium-density fibreboard (MDF) and high-density fibreboard (HDF) can be Nordic Ecolabelled according to the criteria for Panels and mouldings for interior use*.

- Hard floor coverings based on materials such as natural stone, agglomerated stone and ceramic. These products can be certified according to the criteria from the EU Ecolabel.

- Polymeric poured seamless floors which form a hard surface upon curing.

- Flooring that is part of the load-bearing structure of the building.

- Flooring sold together with integrated underfloor heating systems.

* *See https://www.nordic-ecolabel.org/product-groups*

Nordic Ecolabelling determines whether a product can be Nordic Swan Ecolabelled or not, and under which criteria a product can apply for a licence.

If there are other types of floor coverings or underlays being used in buildings, that are not mentioned in the product group definition above, and there is a demand for such products to be Nordic Swan Ecolabelled, an assessment may be

made as to whether these can also be included. Nordic Ecolabelling will determine which new products may be included in the product group.

Background to the product group definition

The type of floor coverings included in the product group definition has been clarified by referring to relevant standards. Hybrid floorings may be certified if they can meet all requirements such as requirements for materials. For instance, hybrid flooring whose main material is resilient plastics must fulfil the material requirements on plastics. Recycled composite material may only be used in floor coverings and flooring underlays if they can fulfil the specific requirements set on this type of material.

The scope of the product group has also been broadened to include underlays as some of these products can contain high shares of renewable and/or recycled materials. Furthermore, because of their ability to improve the customer's experience and extend the service life of floor coverings, their used during an installation has increased. It is worth noticing that both underlays that can be laid without adhesive under floating or loose-laid installed floor coverings and those attached/glued to the floor covering can be Nordic Ecolabelled; even if this can complicate products separation and hamper material recovery/reuse. Indeed, neither the manufacturer nor Nordic Ecolabelling have the steerability to influence how the underlays is installed after being sold to the customer.

Flooring underlays are added to the product group definition as a separate product type. Indeed, the choice of flooring underlays does not depend only on the type of floor coverings installed above but also on the substrate (e.g.., wood, concrete, old floor coverings) it lays on. That is why it is not feasible to certify a flooring underlay together with a specific floor covering as many different combinations of floor coverings/flooring underlays would need to be generated and some might not be even fitted for use.

Textile flooring is removed from this product group and included in the product group "Carpets, floor rugs and floor mats". Indeed, a lot of specific requirements are specifically set on this type of product, and it was deemed as more relevant to include it with other similar products mainly made of textile fibres.

Rubber floorings are still not included as it is known for a fact that they cannot fulfil the requirement on the mandatory share of renewable material, recycled material or combination of both. The use of PVC in floor covering and flooring underlays is forbidden for the reasons named in the background text of requirement O5.

4.2 Definitions

Words/Terms	Definitions
Bamboo flooring	Bamboo flooring means floor coverings made of bamboo in solid pieces or in agglomerates mixed with a binder. No standard definition is available yet.
CITES	Convention on International Trade in Endangered Species of Wild Fauna and Flora. CITES is an international convention for the control of trade (across borders) in wild fauna and flora at risk of extinction.
CoC	Chain of Custody – certification that ensures traceability in the supply chain.

COD	Chemical oxygen demand. A measure of how much oxygen is used during chemical degradation of organic matter.
Cork floorings	Cork floor covering means granulated cork mixed with a binder, and then cured or several layers of cork (agglomerated/veneer) can be pressed together with glue. There are two main classes of cork coverings: cork tile flooring in accordance with EN 12104 and engineered cork flooring.
Decor paper	Decor papers enable surface upgrades for wood-based substrates for use in the production of furniture, laminate flooring and other interior and exterior design panels.
Floating installation	This works with engineered, for instance, wood, laminate, cork, cork tile and bamboo floorings over a wood or concrete subfloor or existing flooring. Tongue-and-groove planks or tiles locked together mechanically. Some products are also glued together at the joints. The material generally goes over a thin foam or cork pad (known as flooring underlays), which fills minor flaws in the subfloor and absorbs sound. Installations over concrete require a thin plastic vapour barrier.
FSC	Forest Stewardship Council Certification scheme for forestry and traceability in the supply chain.
Genetically modified organisms (GMO)	An organism, with the exception of human beings, in which the genetic material has been altered in a way that does not occur naturally by mating and/or natural recombination. Within the terms of this definition: (a) genetic modification occurs at least through the use of the techniques listed in Annex I A, part 1 of the DIRECTIVE 2001/18/EC; (b) the techniques listed in Annex I A, part 2 (DIRECTIVE 2001/18/EC), are not considered to result in genetic modification.
Glued down installation	Engineered wood is typically glued. Other types of flooring can also be glued down. Adhesive onto a clean, flat, wood or concrete subfloor or existing flooring should be troweled and lay down the sheets, planks, or tiles. No vapour barrier is required. Some glue-down flooring is simply peel-and-stick, the easiest to install. Floorings should not be installed over a concrete sealer of painted concrete. If present, it should be removed by gridding or sanding. Floorings should not be installed over slick, heavily troweled or burnished concrete. For glued down floorings, when installing products wider than 8 cm, a bead of recommended wood glue to all the end grooves prior to installing into the adhesive should be applied.
Hybrid floorings	Hybrid flooring means the next generation of floor coverings that combine several aspects of wood, laminate and resilient floorings. The hybrid floorings can be made of a wide range of materials depending on the properties and characteristics that want to be achieved. Among these materials are ceramic, vinyl layers or resilient plastics.
IFL	Intact Forest Landscape Continuous propagation of natural ecosystems within the zone with current forest spread, showing no sign of significant human activity. The area is large enough to maintain all natural biodiversity, including viable populations of widespread species.
Ingoing substances and impurities	**Ingoing substances:** All substances in the chemical product regardless of amount, including additives (e.g., preservatives and stabilisers) from the raw materials. Substances known to be released from ingoing substances (e.g., formaldehyde, arylamine, in situ-generated preservatives) are also regarded as ingoing substances. **Impurities:** Residues from production, incl. raw material production, which remain in the chemical product at concentrations below 1000 ppm (0.1000% by weight). Examples of impurities are residues of reagents incl. residues of monomers, catalysts, by-products, scavengers (i.e., chemicals that are used to eliminate/minimise undesirable substances), detergents for production equipment and carry-over from other or previous production lines.
IUCN	International Union for Conservation of Nature IUCN's Red List is the world's most comprehensive overview of the global conservation status of the planet's species, including trees.
Laminate	Laminate means a process in which paper is used in the product, e.g., melamine, HPL or compact laminate.
Laminate flooring	Laminate flooring means, in accordance with the definition provided in the EN 13329, a floor covering with a surface layer consisting of one or more

	thin sheets of a fibrous material (usually paper), impregnated with aminoplastic, thermosetting resins (usually melamine), pressed or bonded on a substrate, normally finished with a backer. Two main classes of laminates are produced depending on the process of manufacture, High pressure laminate (HPL) and direct pressed laminate (DPL).
Linoleum	A natural product made of linseed oil, wood, limestone, cork, and resins.
Nanomaterial	'Nanomaterial' means a natural, incidental or manufactured material consisting of solid particles that are present, either on their own or as identifiable constituent particles in aggregates or agglomerates, and where 50 % or more of these particles in the number-based size distribution fulfil at least one of the following conditions: (a) one or more external dimensions of the particle are in the size range 1 nm to 100 nm; (b) the particle has an elongated shape, such as a rod, fibre or tube, where two external dimensions are smaller than 1 nm and the other dimension is larger than 100 nm; (c) the particle has a plate-like shape, where one external dimension is smaller than 1 nm and the other dimensions are larger than 100 nm.
PEFC	Programme for the Endorsement of Forest Certification Certification scheme for forestry and traceability in the supply chain
Recycled materials	Recycled materials are defined according to ISO 14021 in the following two categories: ”Pre-consumer/commercial” is defined as material diverted from the waste stream during a manufacturing process. Excluded is reutilization of materials such as rework, regrind or scrap generated in a process and capable of being reclaimed within the same process that generated it. Nordic Ecolabelling defines rework, regrind or scrap, that cannot be recycled directly in the same process, but requires a reprocessing (e.g., sorting, remelting and granulation) before it can be recycled, to be pre-consumer/commercial material. This is regardless of whether it is produced in-house or externally. ”Post-consumer/commercial” is defined as material generated by households or by commercial, industrial and institutional facilities in their role as end-users of the product, which can no longer be used for its intended purpose. This includes returns of material from the distribution chain. Materials that are approved as input in FSC Recycled and which are covered by the term Reclaimed in FSC are regarded as recycled material.
Renewable raw materials	Resources that have a natural rate of availability and yield a continual flow of services which may be consumed in any time period without endangering future consumption possibilities as long as current use does not exceed net renewal during the period under consideration. Wood is a renewable raw material while calcium carbonate is not.
Resilient flooring	Refers to floor coverings that occupy a middle ground between soft floors (like carpeting) and hard floors (like stone or hardwood). According to industry group Resilient Floor Covering Institute (RFCI), only six types of floor coverings can be called resilient flooring: Vinyl and other thermoplastic, linoleum, cork, rubber, asphalt and polymeric poured seamless floors.
Surface treatment	All techniques that aim to provide a twofold basic functionality: a) to protect the underlying material (wood, cork, bamboo-based materials) against deterioration by the adjacent environment and b) to decorate or improve the aesthetic aspect of the surface. Protection should be given against physical and chemical attacks, including water, chemical agents, UV-light and dirt. The aesthetic aspects refer to characteristics like colour performance, gloss and desire surface structure. The basic principle relies on the fact that most of the wood species, cork and bamboo are hygroscopic and absorb stain and lacquer in different ways depending on their porosity and the cell structure.
VOC	Volatile organic compounds (VOC) are defined as any organic compound having an initial boiling point less than or equal to 250°C measured at a standard pressure of 101.3 kPa. This definition is the same as in the Paints Directive (2004/42/EC).
Vinyl flooring	Vinyl comprises the majority share of the resilient flooring market. This includes Vinyl Composition Tile (VCT), Solid Vinyl Tile (SVT) and Luxury Vinyl Tile (LVT).

Wood-based panels	Example of wood-based panels and manufactured board: Particleboard MDF (Medium Density Fibreboard) HDF (High Density Fibreboard) MFB (Melamine Faced Board) Plywood OSB (Oriented Stranded Board) LVL (Laminated Veneer Lumber)
Wooden flooring	Wooden flooring is defined in accordance with prEN 13756 (revised in 2014) as the assembly of wood elements, pre-assembled boards or parquet panels which constitutes the wearing surface of the floor. This definition includes solid wood flooring, multi-layer wood flooring and wood veneer floor covering.

4.3 Overview of the requirements

The criteria are mainly divided into requirement areas where some of the requirements apply to all flooring types and underlays, while others only apply to certain product types. The table below provides an overview of the requirements that must be met for the different flooring types and underlays.

Requirement area	Requirement/Material	Requirement	Responsibility for documentation
General requirements			
Description of product, of the production process and overview of chemicals	General requirements	O1– O3	Product manufacturer
Share of renewable/recycled raw materials	General requirements	O4	Product manufacturer
Chlorinated plastics in floor coverings and flooring underlays	General requirements	O5	Product manufacturer
Materials			
Wood raw material	Nordic Swan Ecolabelled laminate and wood-based panel	O6	Wood-based panels manufacturer
	Tree species – restrictions	O7	Product manufacturer/Subcontractor
	Traceability and certification	O8	Product manufacturer
	Chemicals in reused wood and recycled material	O9	Product manufacturer/Subcontractor
Linoleum	Flax (linen), other bast fibres and linseed oil	O10	Product manufacturer
Other materials	Origin	O11	Product manufacturer/Supplier of material
	Recycled fibres - test for harmful substances	O12	Product manufacturer/Supplier of material
	Chemicals in recycled leather	O13	Product manufacturer/Supplier of material
Plastic, rubber and foam	Raw materials for bio-based polymers	O14	Product manufacturer/Supplier of material
	Emission to water from production of foams	O15	Supplier of material
	Blowing agents in foams	O16	Supplier of material
	Rubber, synthetic latex (SBR) and natural latex	O17	Supplier of material

	Recycled plastic, rubber and foam – Traceability	O18	Product manufacturer/Supplier of material
	Chemicals in recycled plastic, rubber and foam	O19	Product manufacturer/Supplier of recycled material
	Additives – Prohibited substances	O20	Product manufacturer/Supplier of material
Material based on recycled composite	Recycled composite	O21	Product manufacturer/Supplier of material
	Recycled composite - Additives – Prohibited substances	O22	Product manufacturer/Supplier of material
	Chemicals in recycled composite	O23	Product manufacturer/Supplier of material
Production			
Chemicals	Antibacterial substances	O24	Product manufacturer and chemical manufacturer/supplier of chemical product
	Classification of chemical products	O25	Product manufacturer/supplier of chemical product
	Classification of ingoing substances	O26	Product manufacturer/supplier of chemical product
	Preservatives	O27	Product manufacturer/supplier of chemical product
	Prohibited substances	O28	Product manufacturer/supplier of chemical product
	Nanomaterials	O29	Product manufacturer/supplier of chemical product
	Volatile organic compounds	O30	Product manufacturer/supplier of chemical product
	Free formaldehyde	O31	Product manufacturer/supplier of chemical product
Requirement specific to surface treatments	Application method and quantity applied – surface treatment	O32	Product manufacturer/surface treatment contractor.
	Environmentally harmful products and substances in surface treatment	O33	Product manufacturer
	Quantity of applied volatile organic compounds (VOC) in surface treatments	O34	Product manufacturer
Occupational hazard	Emissions to air from production of laminate	O35	Product manufacturer
	Polyurethane	O36	Product manufacturer/Supplier of material
Energy and Waste	Energy mapping	O37	Product manufacturer
	Energy consumption	O38	Product manufacturer/Supplier of material
	Handling of waste and production waste	O39	Product manufacturer
Packaging			
Packaging	Packaging	O40	Product manufacturer
Use-phase requirements			
Emission	Emissions from floor coverings and flooring underlays	O41	Product manufacturer
Quality and durability requirements	Product performance – third-party verification	O42	Product manufacturer
	Quality and durability of floor coverings	O43	Product manufacturer
	Quality and durability of flooring underlays	O44	Product manufacturer

	Wet room approval	O45	Product manufacturer
Circular requirements			
Circular requirements	Labelling and traceability	O46	Product manufacturer
	Warranty and Reparability	O47	Product manufacturer
	Recyclability	O48	Product manufacturer
	Product information	O49	Product manufacturer
Innovation			
Innovation	Innovation	O50	Product manufacturer/supplier of chemical product
License maintenance			
License maintenance	Customer complaints	O51	Product manufacturer
	Traceability	O52	Product manufacturer

4.4 General requirements

Background to requirement O1 Description of the product and material composition

All the required information and especially, the material composition, is crucial for determining whether the floor covering, or underlays is eligible for the Nordic Swan Ecolabel, the requirements that must be met, and who (e.g., subcontractors/suppliers) must document the requirements. It is central for obtaining a good overview and a smooth licence processing procedure.

Background to requirement O2 Description of the production chain and the manufacturing process

To obtain a clear overview of the product, it is important to have a description of the manufacturing process, of the supply chain and of the different chemicals used during the process. This facilitates the assessment of which requirements in the criteria must be fulfilled and documented. Flow charts are usually good tools to illustrate the different manufacturing steps and the origins of the material used.

Background to requirement O3 Overview of chemical products

To gain an overview of which chemicals are used in the various processes in the production, the criteria require the submission of a list of all the chemicals used.

Background to requirement O4 Share of renewable and/or recycled raw materials

The RPS analysis shows that the cultivation or production of raw materials used in the manufacturing and construction of floor coverings or underlays has high relevance. Both processes are very energy and resource demanding and that is why they have a big influence on the overall environmental impact of the products.[12,13]

Production of virgin raw materials and especially those of fossil origins can contribute greatly to climate change. Most of the chemicals, polymers and plastics used in the manufacturing of floor coverings and underlays are still produced from oil and its extraction leads ultimately to an increase of greenhouse gases concentration in the atmosphere. Renewable raw materials are less

[12] https://www.ivl.se/download/18.2eac00c7186755d386513d8d/1678965483510/B2463.pdf
[13] https://www.ivl.se/download/18.4c0101451756082fbad78/1603698658279/B2385.pdf

impactful if considering their contribution to climate change. However, their contribution to diversity loss though land use has been proven and that is why it is important that, for instance, wood, cork and bamboo are cultivated in the less impactful manner (see material requirements for more information).[14]

Nordic Ecolabelled floor coverings and underlays must have a reduced overall environmental impact from a life cycle perspective. Hence, Nordic Ecolabelled strives to promote the use of responsibly sourced renewable and/or recycled raw materials in floor these products. Many manufacturers are already using recycled material to make new products. For instance, the installation of plastic and linoleum flooring generates approximately 10% scraps (pre-consumer recycled material). For many years, these scraps have been reintroduced into the manufacturing process of several producers to make new floor coverings. The access to post-consumer material of good quality/purity and the material's overall availability, especially for linoleum, has proven to be difficult. Lately, initiatives like Forbo's "Back to the floor recycling program" and Tarkett's ReStart® aim to increase the share of post-consumer recycled material in their floor coverings by recycling their own used floors. Even if these initiatives would guarantee an access to a lot of resource of known good quality/purity, they are still being slow down by complicated traceability and logistic challenges. Another way to reduce the products' contribution to climate change is to replace the fossil raw materials by vegetable crops. Hence, plastics whose building blocks are produced from renewable raw materials, or bio-based plastics, have been increasingly used in floor coverings.

Due to the material heterogeneity of the product group, the requirement can be fulfilled in three different ways. The first alternative a) requires that the floor consists of at least of 90% responsibly sourced renewable materials and is intended to be fulfilled by solid wood floors, parquet, veneer, bamboo, cork floor coverings, floor coverings of similar construction, and flooring underlays. The second alternative b) requires the floor to consist of at least 60% recycled raw materials, thereof half of it must come from post-consumer recycled material. The last alternative c) allows also floors that consist of both recycled and renewable raw materials to fulfil this requirement. Renewable raw materials and recycled raw materials are weighted equally (see specific requirements on renewable materials in chapter 4.5 Materials for more details). The level of requirement and the limit value of 70% have been set so that only plastic, linoleum, hybrid and laminate floor coverings containing a certain share of recycled material in combination with responsibly sourced renewable raw materials can meet the criteria. It is worth noticing that the fillers are still not included in the calculations as it has proven difficult to source them as pre- or post-consumer recycled material. Pigments are not counted as a filler but as additive. Consequently, they must always be included in the calculations.

The requirement on the proportion of recycled and/or renewable raw materials must be calculated and met for the floor as a whole, including the laying/joining system. Examples of this include locking springs in milled grooves or permanently mounted aluminium rails. These components/materials amount to a very limited proportion of the materials for the entire floor, which is why the

[14] https://susproc.jrc.ec.europa.eu/product-bureau/sites/default/files/contentype/product_group_documents/1581685016/Preliminary%20report%20sept%202014_revLCE_AB.pdf

criteria document does not cover any specific material requirements for these. If an adhesive-free floor is instead sold with a separate laying system, this must also be counted in the percentage of the floor by weight.

Background to requirement O5 Chlorinated plastics in floor coverings and flooringunderlays

The requirement covers both floor coverings and flooring underlays which may include PVC and/or PVDC as a material/component. Nordic Ecolabelling acknowledges that much has been done by industry to reduce the climate and health impact of PVC manufacturing and PVC products within the last 10 years. However, Nordic Ecolabelling reckons that the use of PVC in floor coverings and flooring underlays is still problematic for the following reasons:

- Although the recyclability of PVC and PVC products is undeniable, and PVC recycling systems are under development, it is still a challenge for the industry to collect, sort and process the material so that it does not contaminate new products with harmful legacy chemicals. Nordic Ecolabelling has looked into the possibilities of requiring take back systems for specific PVC product areas. Unfortunately, it may take time before all actors involved throughout the service life of a floor covering manage to run a fully functional take-back system.

- Although emissions of polyaromatic hydrocarbons (PAH), benzo-a -pyrene, dioxins and furans from incineration plants have been significantly reduced, and technologies for the management of air pollution control residues have been developed, not all the Nordic countries allow incineration of PVC. Denmark has a waste legislation that states that all PVC products must be sorted for material recycling. However, the difference in composition of products made of soft PVC (such as flooring) render their recycling difficult and must currently be sent to landfill, resulting in potential leaching of additives to the environment.[15] Furthermore, as a principle matter, Nordic Ecolabelling does not want to certify products that end up in landfills.

- Although the use of the most problematic phthalates is now restricted in the EU, other additives hazardous to the environment and health (e.g., plasticizers and stabilizers) can still be used in PVC as well as in other plastics.[16] The recent ECHA's work on a restriction proposal on the use of PVC and its additives is in line with Nordic Ecolabelling's specific concerns with PVC[17,18].

- Although mercury cells are not used in Europe anymore, the replacing membrane technology requires the use of harmful substances (PFAS) to produce the chlorine gas needed in PVC and other chemicals/plastics production.[19,20] How much PFAS are released to the environment throughout

[15] https://op.europa.eu/en/publication-detail/-/publication/e9e7684a-906b-11ec-b4e4-01aa75ed71a1
[16] https://echa.europa.eu/sv/mapping-exercise-plastic-additives-initiative
[17] https://echa.europa.eu/documents/10162/17233/mandate_pvc_and_additives_rev_en.pdf/a860fd87-4231-5ed4-157b-f6cda1ee5832?t=1655721970555
[18] https://echa.europa.eu/documents/10162/7d64f1d7-b29f-94ec-4477-9bcebf737a82
[19] https://eippcb.jrc.ec.europa.eu/reference/production-chlor-alkali-0
[20] https://www.eurochlor.org/publication/fluoropolymers/

the service life of the membrane and how the membrane is disposed afterwards as waste, are issues in need of more investigation.

- Although the purpose of Nordic Ecolabelling is to guide the consumer to choose the best products from an environmental perspective, communicating on potentially Nordic Ecolabelled PVC products could be challenging and be regarded as misleading. Additionally, there is a risk that the trustworthiness of the Nordic Ecolabel could be undermined if Nordic Ecolabelled vinyl flooring were to be found on the market, as many NGOs still advise to avoid the use of soft PVC products.

4.5 Materials

This chapter includes requirements for different materials such as wood (including bamboo and cork), linoleum, other raw materials, plastic, rubber, foam, and wood plasic composites used in floor coverings and underlays.

The requirements only apply to materials that accounts for more than 5 wt% of the floor covering or underlays. Water is exempted from all requirements.

Floor coverings and underlays consisting of several differing types of materials needs to comply with the specific material requirements e.g., a hybrid flooring must comply with requirements for wood raw materials and plastics raw materials. The same reasoning applies to underlays containing a combination of wood raw materials and other renewable raw materials.

Chemicals used in the production of finished layer/components included in floor coverings such as manufactured board or backing foams must fulfil requirements from section 4.6.1 Chemicals.

4.5.1 Wood raw materials

The requirements in this chapter concern raw materials such as wood, cork or bamboo that are included in underlays, wood flooring and manufactured boards used e.g., in wood (engineered or design floorings), laminate or hybrid floorings.

Wood raw material in paper must also fulfil requirements O7 and O8 if the floor coverings or flooring underlays contains more than 10 wt% paper.

Background to requirement O7 Tree species – restrictions

The requirement concerning tree species that are banned or restricted is new and part of Nordic Ecolabelling's general forestry requirements. The requirement only applies to virgin wood and not wood defined as recycled material in accordance with ISO 14021.

A number of tree species are not allowed to be used or are allowed only under certain conditions. The tree species are shown on a list, and the species on the list are based on tree species that are relevant to the Nordic Ecolabelling criteria, i.e. wood that may be relevant to use in Nordic Swan Ecolabelled products. Listed tree species are indicated by the scientific name and most common trade names. The scientific name/trade name is not always sufficient, as there may be more than one scientific name/trade name for the listed tree species, not all of which feature on the list.

Criteria for tree species on the list:

a) Species listed in CITES Appendices I, II and III.

b) IUCN Red List, categorised as Critically Endangered (CR), Endangered (EN) and Vulnerable (VU).

c) Rainforest Foundation's list of tropical tree species

d) Siberian larch (derived from forests outside the EU)

Use of species on the CITES list in Nordic Swan Ecolabelled flooring and underlayment products is prohibited. CITES is an international convention for the control of trade (across borders) in wild fauna and flora. Depending on how endangered they are, the tree species in CITES are listed in Appendix I, II or III. Species listed in Appendix are critically endangered and trading in these species is completely forbidden. Special permits for import and export are required for species in Appendices II and III. Trees with valid CITES permits are considered to be legally harvested under the EUTR (EU Timber Regulation). The Nordic Swan Ecolabel's ban on the use of tree species listed in CITES (Appendix I, II or III) goes beyond EU legislation. CITES regulates trade in endangered species, and there are also challenges concerning corruption in trade with wild animals and plants. Nordic Ecolabelling therefore does not wish to approve species on any of the appendices.

IUCN's Red List is the world's most comprehensive overview of the global conservation status of the planet's species, including trees. IUCN has established clear criteria to assess the risk of extinction according to the origin of tree species. These criteria cover all countries and all species in the world. Nordic Ecolabelling is aware that the IUCN Red List system focuses only on the extinction risk of species, and is therefore not designed for an overall assessment of whether a tree can be of sustainable origin. However, the list is updated continuously and is thus an important tool to estimate the conservation status of a specific tree species globally. The Nordic Swan Ecolabel seeks to prohibit tree species listed as endangered (categories CR, EN and VU).

The Rainforest Foundation is an NGO in Norway that works to protect the world's remaining rainforests. At the moment, the Rainforest Foundation does not see any credible certification schemes operating in the tropics, and therefore recommends not buying tropical woods. The Rainforest Foundation has developed a list of tropical tree species based on tree species that are found on the Norwegian market. This list serves as a guide in complying with Norwegian guidelines for not using tropical wood in public-sector construction projects. Nordic Ecolabelling considers this to be a pragmatic approach for handling tropical wood in the Nordic market.

Siberian larch (with origins in forests outside the EU) is also on the tree list. Siberian larch is a sought-after type of wood in the construction industry due to its high quality. Species of this tree are widespread in the Eurasian North Boreal climate zone, with the species Larix sibirica, Larix gmelinii, Larix cajanderi and Larix sukaczewii particularly widespread in the large areas of Intact Forest Landscapes (IFL) in Russia. Siberian larch should be seen as an indicator species for boreal IFL areas that need to be kept intact.

Exemptions:

Exemption for the use of eucalyptus and acacia in production of fibreboards and particleboards: Eucalyptus and Acacia are grown in plantations for the specific use in the wood fibre and pulp/paper industry. Fibre raw material from acacia/eucalyptus must, however, be a minimum of 70% FSC/PEFC certified. The remaining proportion of fibre raw material must be covered by the FSC/PEFC control schemes. See requirement O8 for more information.

Nordic Ecolabelling is aware that wood on lists b), c) or d) may come from legal and sustainable forestry. Therefore, it is possible to use tree species listed under b), c) or d) if the applicant/manufacturer/supplier can demonstrate compliance with a number of strict certification and traceability requirements.

Many of the trees on the list grow in countries that still have large Intact Forest Landscapes (IFL). It is important to protect these for the sake of biodiversity and the climate. Several of these countries are at high risk of corruption, and national legislation relating to the environment, human rights and land ownership is often weak and/or not enforced by the authorities. There are different views on whether certification is good enough to meet the challenges of forest management in countries with a high risk of corruption and illegal logging. For example, relevant challenges related to this were published by Danwatch in a number of articles in 2018[21],[22], and by redd-monitor.org in 2019[23]. Greenpeace International has terminated its membership of FSC for the reason that the certification body no longer fulfils its goals of protecting forests and human rights[24]. Other environmental organisations like WWF support certification as an important tool for sustainable forestry in these countries. Due to the uncertainty that FSC and PEFC certification systems are good enough to protect important areas of biodiversity and ethical aspects such as human rights and land ownership in areas with a high risk of corruption, Nordic Ecolabelling takes a precautionary approach and seeks further documentation about the tree species and its origins.

To document full traceability of the tree species, the applicant/manufacturer/supplier must present a valid FSC/PEFC Chain of Custody certificate covering the specific tree species and demonstrate that the wood is controlled as FSC or PEFC 100%, through the FSC transfer method or PEFC physical separation method. This means that the FSC percentage or credit control system and the PEFC percentage system are not approved. Full traceability of the wood back to the forest/certified forest unit makes it possible to document that the tree species does not come from an area/region where it is on the IUCN Red List, categorised as CR, EN or VU. Full traceability also makes it possible to document that the tree species does not come from an Intact Forest Landscape (IFL), as defined by Intactforest.org in 2002[25]. Intactforest has monitored IFL areas since 2000 and has developed an updated online map tool

[21] https://danwatch.dk/undersoegelse/dokumentfalsk-og-millionboeder-danske-byggemarkeder-saelger-trae-forbundet-til-ulovlig-hugst-i-amazonas/
[22] https://danwatch.dk/undersoegelse/baeredygtighedsmaerke-er-ingen-garanti-for-baeredygtigt-trae/
[23] https://redd-monitor.org/2019/08/29/evicted-for-carbon-credits-new-oakland-institute-report-confirms-forced-evictions-for-green-resources-plantations-in-uganda/
[24] https://www.greenpeace.org/international/press-release/15589/greenpeace-international-to-not-renew-fsc-membership/
[25] http://www.intactforests.org/world.webmap.html

that shows the scope of IFLs back to 2002. The monitoring results show that the world's IFLs are disappearing at an alarming rate, which is why Nordic Ecolabelling refers to 2002.

Plantations: Nordic Ecolabelling believes that responsibly managed forest plantations can play a role in preserving natural IFLs by reducing the pressure to cut down the world's remaining natural forests. In order to ensure that the plantation has not replaced original ecosystems (forests/grasslands) over the last 25 years, tree species must come from FSC or PEFC certified plantations that were established before 1994. 1994 follows FSC's international forest management standard (version 5.2), while PEFC works with 2010.

Background to requirement O8 Traceability and certification

Nordic Ecolabelling's requirements concerning raw material based on wood, bamboo or cork focus on sustainable forestry and traceability of raw materials.

The many benefits that sustainably managed forests deliver to society include wood for materials and energy, protection against global warming, homes and livelihoods for local communities and indigenous peoples, support of biodiversity and protection of water and soil from pollution and erosion. By setting a requirement that wood raw material must originate from certified, sustainably-managed forests, Nordic Ecolabelling is supporting the move towards more sustainable forestry practices.

Nordic Ecolabelling requires a declaration of the species of wood contained in the Nordic Swan Ecolabelled product. This makes it possible to check the validity of Chain of Custody certificates in the supply chain. The requirement for CoC certification improves the traceability of materials in the supply chain within the guidelines and control systems of the FSC and PEFC. The company's CoC certification proves how certified wood is kept separate from other wood during production, administration and storage and is inspected annually by independent certification bodies.

The manufacturer of the product must be CoC certified, and there is a requirement that certified raw material must be assigned/allocated to the Nordic Swan Ecolabelled product in the accounts for certified/non-certified material. This ensures that FSC/PEFC credits are used for the Nordic Swan Ecolabelled production and that the credits are "used up" and not sold twice. This will stimulate increased demand for certified wood raw material because more certified wood raw material must be purchased if the manufacturer wants to label other products, and not just the Nordic Swan Ecolabelled products, with the FSC/PEFC logo. This also means that it is possible to label the finished product with the FSC/PEFC logo and that a Nordic Swan Ecolabelled product can carry both the Nordic Swan Ecolabel logo and the FSC/PEFC logo. It should be noted that Nordic Ecolabelling approves both the percentage system and the credit system for accounting and sale of certified material.

Because PEFC/FSC certified oak is difficult to find in the Nordic countries and that war between Ukraina and Russia has put a pressure on its importation, Nordic Ecolabelling has decided to introduce a specific requirement on parquet containing oak. A stepwise increase share of certified wood raw material from 60 to 70% over 3 years is required specifically for oak parquet. All other wood-based

floor coverings must fulfil the limit value of 70% PEFC/FSC certified wood raw material from the beginning of criteria validity.

Background to requirement O9 Chemicals in reused wood and recycled material

The requirement is set to have better control over the type of recycled material used and to ensure that materials containing undesirable substances are not used. The requirement is the same as that set out in Nordic Ecolabelling's Criteria for furniture and fitments (generation 5) and the EU Ecolabel Criteria for furniture. Compliance with this standard is relatively good in the EU but it is important to ensure that production outside the EU also complies with the requirements of the standard. Requirements are imposed on the content of a number of heavy metals and creosote. If it can be documented that the requirements of the German Waste Wood Ordinance regulation, 2002 or later are met, this will also be approved as documentation.

The definition of 'treated wood' has been updated after consultation to also include wood treated with creosote due to a consultation comment from the Danish Environmental Protection Agency, with reference to the restriction proposal[26].

4.5.2 Linoleum

The requirements in this section cover raw materials used in the manufacture of linoleum flooring. Both jute used in the backing of the flooring and linseed oil used in the manufacture of the linoleum cement must fulfil the requirements. Because linoleum flooring manufacturers may buy their raw materials from a multitude of suppliers, it may be accepted that the license holder documents the requirement for 50% of its jute and linseed oil total purchases.

The chemicals used in the manufacture of the linoleum cement must fulfil the requirements from the section 4.6.1 Chemicals.

Background to requirement O10 Flax (linen), other bast fibres and linseed oil

The use of natural and renewable raw materials has the advantage that it does not draw directly on fossil resources. It remains relevant, however, to consider whether these renewable raw materials are sustainably cultivated with minimum damage to the environment. It is, for example, important to ensure that there has been no use of harmful pesticides that could lead to a loss of biodiversity. The requirement can be documented by sending a European Flax Standard certificate or equivalent. According to this standard, the flax is grown following European legislation EU 1107/2009. It is not uncommon for flax from Europe to be sold to countries in Asia for use in textiles and several Asian productions have a certificate for the European Flax Standard.

Water retting is prohibited unless the wastewater is cleaned to reduce the content of organic material and so comply with the requirement levels. Either biological or chemical retting is necessary to separate the fibres from the inner stem and the outer shell. This is done by exposing the stem or other bast fibre to moisture and heat. Water retting is the most effective method, but there are other methods such as placing the fibres in a tank and adding enzymes. Emissions of retting wastewater with a high content of organic material to the

[26] https://echa.europa.eu/da/registry-of-restriction-intentions/-/dislist/details/0b0236e186d2119a

aquatic environment can result in a lack of oxygen during degradation, which can damage the aquatic animal and plant life. Requirements for water retting are not covered by the European Flax Standard.

Nordic Ecolabelling is aware that linoleum flooring manufacturers may buy their raw materials from a multitude of suppliers making the documentation of this requirement a time-consuming task. That is why, it can be accepted that the license holder documents the requirement for 50% of its raw material purchases. This option may give more flexibility and may speed up the documentation process by focusing on the bigger suppliers.

4.5.3 Other materials

The requirements in this section concern other materials than the ones usually used in resilient floor coverings or flooring underlays. Requirement O11 must be fulfilled regardless the quantity of other materials contained in the product. In addition, requirements O12 and O13 must be fulfilled only if the quantity of, in this case, textile and/or leather exceeds 10% in the product.

Background to requirement O11 Origin

Nordic Ecolabelling is positive about the use of renewable materials but wishes to receive information about their origins as well as, if relevant, the species or type used and their geographical origin. It is important that the renewable raw materials have a sustainable origin and are not suitable for other important uses, such as human food or animal feed. There is therefore a requirement that the raw materials must be waste/residues products or recycled materials from other production.

Nordic Ecolabelling wants to support the circular economy through the use of recycled materials instead of virgin materials. However, fibre to fibre recycling is still limited for textiles and recycled polymers from other synthetic materials are frequently used today as different plastic materials. The requirement thus accepts both fibre to fibre recycling and polymer fibre recycling. Recycled cotton fibre recovered from used clothing and textiles from consumers or industrial waste (post- or pre-consumer textile waste) is also becoming more available.

The requirement stipulates that feedstock used in the recycled raw material must be fully traceable. Without proper traceability, it is difficult to ascertain that the material is recycled. The manufacturer of the recycled raw material can document the traceability by declaring that 100% recycled feedstock has been used.

Prohibition on the use of re-granulate resulting from reprocessing processes that have obtained an approval pursuant to Commission Regulation (EC) No 2022/1616 on recycled plastics materials and articles intended for food contact or approval pursuant to the Code of Federal Regulations Title 21: Food and Drugs, PART 177 — INDIRECT FOOD ADDITIVES: POLYMERS. Plastic materials approved for food packaging require the highest traceability and purity of the plastic raw material and it will therefore be down cycling to use this plastic for anything other than food contact products.

The aim of the requirement is to ensure that only hides that are a by-product of the meat/dairy/wool industries are used. This mitigates the environmental

impact of livestock, and it makes sense from an ethical point of view that the leather and hides produced are derived from a by-product of the meat/dairy/wool industries. Fish skin provided it is not on the IUCN Redlist, is now also included in this version of the criteria. Fish skin must comply with the same requirements as other types of skin and leather.

Background to requirement O12 Recycled fibres - test for harmful substances

It is important to consider the potential exposure of the user and the environment to undesirable chemicals from recycled material. The requirement covers the chemical substances and substance groups that are at greatest risk of being present in recycled fibre for textile production. Recycled fibre may contain residues of additives from previously used dyes, pesticides from cultivation, biocides used during transport, and so on[27]. This applies to both fibre recovered from used textiles and fibre recovered from products other than textiles.

In mechanical recycling processes, all the chemical substances remain in the fibre and may be transferred to the new textile fibre. In the chemical recycling process, some chemical substances remain in the material, and both unproblematic and problematic substances can cause technical interference with the process[28]. It is possible to conduct a spot test for the most relevant substances over a set interval, but since the recycled feedstock may come from multiple sources and can therefore vary a great deal, it is not possible to implement the testing required to identify all the potential “old additives”.

Recycled PET (rPET) that has undergone any recycling process approved by EFSA or FDA as food contact material may not be used as a raw material. Safe access to recycled plastics of best quality must continuously be ensured for manufacturers of food contact packaging. PET that has undergone other recycling processes than one of those approved by EFSA or FDA may however be used. Recycled fibre from PET bottles may also contain small amounts of undesirable substances such as antimony and heavy metals, which are derived from labels, adhesives, printing inks and waste from the transport and sorting of the plastic. However, measurements have established that the levels fall well below the limits set for heavy metals in packaging materials in California’s Toxics in Packaging Prevention Act of 2006[29].

[27] IKEA and H&M analyze the content of recycled fabrics, article 29-10-2019 on Treehugger.com https://www.treehugger.com/sustainable-fashion/ikea-and-hm-analyze-content-recycled-fabrics.html?utm_source=TreeHugger+Newsletters&utm_campaign=9cd1c025b2-EMAIL_CAMPAIGN_11_16_2018_COPY_01&utm_medium=email&utm_term=0_32de41485d-9cd1c025b2-243762625

[28] Nordic Council of Ministers (2016). Gaining benefits from discarded textiles: LCA of different treatment pathways

[29] M. Whitt, Survey of heavy metal contamination in recycled polyethylene terephthalate used for food packaging, Journal of Plastic Film & Sheeting 2012

Background to requirement O13 Chemicals in recycled leather

Release of Cr (VI) compounds is a problem as hexavalent chromium compounds are contact allergens. Cr (VI) is one of the most well-known allergens. Hexavalent chromium (Cr (VI)) is not used in the tanning industry and has no effect in the tanning process. However, chromium (III) salts can - under certain conditions - be converted to Cr (VI) compounds.[30] Regardless of which tanning process is used, it is relevant to ensure that the content of chromium and especially chromium (VI) in the leather is documented and low.

The requirement is also set to ensure that there is no cadmium and lead in the leather. Lead occurs most often due to contaminants in the chromate during chromium tanning.

4.5.4 Plastic, rubber and foam

The requirement in this section applies to all plastic (e.g., polyethylene, polypropylene and polyurethane and their derivatives), rubber and foam contained in floor coverings and underlays. Products including polyurethane must also fulfil the specific requirement O35 Polyurethane in section 4.6.3.

Background to requirement O14 Raw materials for bio-based polymers

In terms of resources and climate impact, it is positive to use renewable raw materials instead of fossil fuels. However, it is important that the cultivation of bio-based raw materials is sustainable. Establishment of palm oil plantations is one of the main reasons for deforestation of rainforests, and thus threatens the livelihoods of indigenous people, plants and animals. Rainforests are very important for biodiversity and in regulating the climate. Soybeans are grown in areas that are often established at the expense of rainforests and forest waters in South America. Soy production is one of the biggest threats to the rainforest on the American continent, especially in the southern Amazon. Based on this, palm oil, soybean oil and soy flour are banned as raw materials for bio-based polymers.

Sugar cane is a relevant raw material for polymer production. Sugar cane is currently not as strongly associated with problems with deforestation of rainforest as mentioned above for palm and soybean oil, but there may also be challenges associated with this production. sugar cane is permitted as a raw material, but it is required that it be certified according to a sustainability standard that meets several requirements for e.g., protection of biological diversity. For all certification systems, there is a requirement for traceability at the mass balance level. Book and claim system will not be approved.

In addition, there is a requirement that sugar cane must not be genetically modified. Genetic modification is a debated topic, and several countries have banned the cultivation of GMOs. Topics discussed are food safety, land use, lack of knowledge about effects under local agricultural / forest conditions and the risk of negative environmental and health impacts. Nordic Ecolabelling emphasizes the precautionary principle and regulations that have a holistic approach to GMOs. This means that sustainability, ethics, and societal benefits must be emphasized together with health and the environment. Concerns exist about the consequences when genetically modified plants, animals and microorganisms spread in nature. Nordic Ecolabelling believes that GMOs should be assessed on

[30] Investigation and health related assessment (allergy only) of chromium in leather shoes

a case-by-case basis. Research results have not clearly shown that current GMO crops contribute to the development towards sustainable agriculture with less use of pesticides, and there is a lack of research on the long-term effects of genetically modified plants, both environmental consequences and socio-economic consequences. There are possible adverse effects of GMOs along the entire value chain from research and development of the plants, via cultivation, to storage, use and waste management. In several of these phases, there is a lack of scientific studies, and there is a lack of overall assessments.

For other primary raw materials, there is a requirement that the name of the raw material, supplier and origin of the raw material must be stated. The most ideal is to use waste and residual products from other productions, e.g., by-products such as straw from cereal production and by-products from maize. By using secondary raw materials, parts that are not used as food are utilized. PFAD (Palm Fatty Acid Distillate) from palm oil is not considered a residual raw material and must therefore not be used. PFAD occurs in the production of palm oil for the food industry, and there is rarely traceability in the processes in which PFAD occurs. The requirement has been tightened after the consultation period, so that only waste or residual products defined in accordance with (EU) Renewable Energy Directive 2018/2001 from other raw materials than Bonsucro certified sugar cane may be used in bio-based polymer production.

Background to requirement O15 Emissions to water from production of foams

Foam materials may be used as backing in floor coverings. Since there are environmental problems associated with the production of foam made of latex or polyurethane, it is relevant to set requirements concerning these. Nordic Ecolabelling requires emissions of oxygen demanding substances from the production to be low.

Background to requirement O16 Blowing agents in foams

Halogenated organic compounds may not be used as blowing agents or auxiliaries for these. Historically, CFC (ChloroFluoroCarbons), HCFC (HydroChloroFluoroCarbons) and HFC (HydroFluoroCarbons) have been used in the production of PU foam, and it is generally known that these substances are harmful to the environment, especially as greenhouse gases and as ozone depleting substances. The requirement prohibits the use of halogenated organic compounds that are used as blowing agents or auxiliaries for these. Many manufacturers of PU foam have replaced CFC and HCFC with carbon dioxide but ensuring that they are not used is still considered relevant. Blowing agents are only relevant for PU foam, as the production of latex foam does not require blowing agents. Expanded polystyrene uses water or pentane as a blowing agent.

Background to requirement O17 Rubber, synthetic latex (SBR) and natural latex

A number of synthetic latex materials are made of substances that are hazardous to the environment and human health, for example substances that are suspected to cause cancer. One substance that acts as a monomer in the production of latex is 1,3-butadiene (CAS No. 106-99-0) which has H340 and H350 classifications. There is therefore a requirement for content of butadiene to be tested to ensure that the monomer content of the final latex is low.

There are more than 100 PAHs compounds. Several of the PAHs are carcinogenic and classed as Carc. 1B. PAHs can be found in plastic and rubber parts in a wide range of consumer products. They are present as impurities in some of the raw materials used to produce such products, namely in plasticising oils and in carbon black. The substances are not intentionally added to the products in question, and they have no specific function as constituent ingredients of the plastic or rubber parts. Extender oils are mineral oils that are produced from crude oil (PAHs that remain in the oil are called petrogens). Carbon black is the product of incomplete combustion or thermal decomposition processes of heavy oils, such as coal tar (PAHs that remain, however, are mainly pyrogenes PAHs). The requirement is harmonized with the levels in Oeko-tex 100 standard class II.

The requirement has been changed and harmonized with the level of requirements in the criteria for furnitures. Nitrosamines and nitrosamine-soluble substances are suspected to be carcinogenic. Nitrosamines are by-products formed in the production of rubber.

Background to requirement O18 Recycled plastic, rubber and foam - Traceability

Nordic Ecolabelling wishes to support a circular economy by encouraging the use of recycled materials over virgin raw material – in this case crude oil. Substantial environmental potential is expected in the future with regard to reduce resource consumption and CO_2 emissions. However, availability and access to recycled polymers/plastics of good quality and purity is still challenging.

See requirement O11 for more information.

The requirement states that the feedstock used in the recycled raw material must be traceable. Without traceability, it is difficult to ensure that the material really is recycled. Traceability can be documented with a certificate from a third-party certifier of the supply chain, such as the Global Recycled Standard, for example. The Global Recycled Standard (GRS) is an international, voluntary standard that sets requirements for third-party certification of recycled content and chain of custody in the supply chain. This standard restricts the use of undesirable chemicals in the manufacture of new products, but the standard does not cover chemicals that may enter via the recycled materials, and thus gives no guarantee about what may be present in the finished GRS product[31] (see more on undesirable chemicals in recycled materials in requirement O19). It is up to Nordic Ecolabelling to assess of additional certification systems for recycled content can be accepted. Alternatively, traceability may be documented by the producer of the recycled raw material declaring that 100% recycled feedstock has been used.

[31] Recycled Claim Standard (RCS) + Global Recycled Standard (GRS) - Textile Exchange

Background to requirement O19 Chemicals in recycled plastic, rubber and foam

The requirement applies to chemicals contained in the recycled plastic raw material and not chemicals that are added through regranulation. There are separate requirements for this, see O28. The requirement must be documented with a test report using X-ray fluorescence (XRF), GC-MS or equivalent methods, or traceability to the source that substantiates that the specified substances are not included. The aim of the requirement is to capture the "worst substances". There are different practices in the industry for testing substances in recycled plastics. Some manufacturers rely on questionnaires/declarations from their subcontractors and follow them up with chemical analyses if it is considered likely that the plastic contains substances of concern. Some manufacturers of recycled plastic have XRF (X-ray fluorescence spectrometer) equipment for testing the plastic to see whether it can meet the given requirement (a level of 100 ppm can be achieved). Although this will entail extra documentation work, it shows that it is possible to set such a requirement. Using recycled plastic is good as it helps reduce resource use and stimulates a circular economy. At the same time, there is no wish to recycle chemicals that are harmful to health and the environment.

After the consultation 8 specific polycyclic aromatic hydrocarbons (PAH) have been added to the requirement. All 8 PAHs are listed in annex XVII in REACH due to risks to human health. PAHs have been found in plastic packaging made of recycled PCR plastic (PE and PP).[32]

Background to requirement O20 Additives - Prohibited substances

See background to requirement in requirement O28.

4.5.5 Materials based on recycled composite

The requirements in this chapter concern floor coverings and flooring underlays containing recycled composite material. The recycled composite material needs only to comply with the requirements in this section 4.5.5.

Background to requirement O21 Recycled composite

The requirement has been changed after the consultation period to clarify that only material based on recycled composite is covered by the criteria. In the consultation version of the criteria wood-plastic composite (WPC) was added as a new material, but the intention was that only recycled material that is already a composite material should be included in the criteria. Materials that are produced by mixing pure fractions of different materials, e.g., wood and plastic, should not be covered by the criteria. This type of material is not allowed mainly since the constituent materials cannot be separated in a recycling process. WPC is also not a very common material used in floor coverings and flooring underlays today. However, new types of products based on materials that are already composites are introduced on the market. The intention is that this type of product should be able to be Nordic Swan Ecolabelled if all requirements in the criteria are met. Composite materials as e.g., composite packaging can be a difficult material to recycle since they consist of different materials. The material is normally sent to incineration. This type of material gets a new area of use when included in a product with long technical lifetime.

[32] https://www2.mst.dk/Udgiv/publications/2023/04/978-87-7038-507-7.pdf

Background to requirement O22 Recycled composite - Additives – Prohibited substances

See background to requirement in requirement O28.

Background to requirement O23 Chemicals in recycled composite

Nordic Ecolabelling wants to support the use of recycled material, but it is important to not circulate substances hazardous to the environment or health. The material used in recycled composite must either be allowed for food contact or be tested. If the material is allowed for food contact, it is guaranteed that the materials have met strict requirements for content of hazardous substances. Nordic Ecolabelling does not consider it as down cycling to use recycled composite material that is allowed for food contact. This material is hard to recycle, and it is considered positive that the material gets a new area of use and is used in a product with long technical lifetime. Today it is not possible to make new composite material allowed for food contact from this material.

4.6 Production processes

4.6.1 Chemicals

Introduction to chemical requirements

The requirements in this chapter apply to chemical products used in the production/assembly of the Nordic Swan Ecolabelled floor coverings or flooring underlays, such as for example adhesives, resins, sealants, or waxes, as well as lacquers, oils, paints, stains or fillers. The requirements also apply to chemicals used at the production site of subcontractors manufacturing finished layers/elements such as manufactured board and backing foam.

Lamination (thin layer of laminate < 2 mm, including melamine) on another panel is not considered to be surface treatment. For a wood-based panel with laminate, both elements must fulfil the requirements for the relevant panel type individually, i.e., the wood-based panel and laminate must both meet the requirements for chemicals.

Chemical products used in the manufacture of paper, and to print patterns on the decor paper, are not covered by the requirements. Auxiliary substances such as lubricants and detergents are also not covered by the requirements.

Requirements specific for surface treatment are presented in chapter 4.6.2.

Definitions

The requirements in the criteria document apply to all ingoing substances in the chemical product. Impurities are not regarded as ingoing substances and are therefore exempted from the requirements. Ingoing substances and impurities are defined as below, unless otherwise stated.

- **Ingoing substances**: All substances in the product, including additives (e.g. preservatives and stabilisers) in the raw materials. Substances known to be released from ingoing substances (e.g., formaldehyde, arylamine, in situ-generated preservatives) are also regarded as ingoing substances.

- **Impurities**: Residues from production, incl. raw material production, which remain in the chemical product at concentrations below 1000 ppm (0.1000% by weight). Examples of impurities are reagent residue incl. residues of monomers, catalysts, by-products, "scavengers" (i.e., chemicals used to eliminate/minimise undesirable substances), cleaning agents for production equipment and "carry-over" from other/previous production lines.

Background to requirement O24 Antibacterial substances

Products treated with antibacterial agents are commonly marketed as preventing bacteria formation, growth and odours. Antibacterial treatment is often unnecessary and should be used with care as the substances can be harmful to health and the environment, and they risk leading to increased antibiotic resistance. For the background to nanomaterials, see the requirement concerning nanomaterials.

Background to requirement O25 Classification of chemical products

Nordic Ecolabelling is generally committed to restricting the use of chemicals that are harmful to health and the environment, and the classification requirement prohibits the products of highest concern.

Exemptions:

As in previous generation, an exemption is given for accelerators in linoleum flooring production from the classification H400 and H410 up to 1 percent of the linoleum, as alternative accelerators without such classifications are not available at the time being.

Similarly, an exemption for adhesive products containing methylene diphenyl diisocyanate (MDI) is kept. There are currently no substitute products that are widely available in the market. Hazard code H373 is no longer exempted because it is not anymore forbidden hazard code in the requirement.

The exemption for adhesives and resins containing formaldehyde is only granted if later requirements O31 and O41 concerning the content of free formaldehyde in adhesives and emissions from the finished product are fulfilled.

Resins containing phenol, formaldehyde, methanol and melamine are used in the production of several types of laminates to impregnate the paper. Since it is not possible to produce laminate without these resins, an exemption is made for these substances. A maximum of 10% by weight of phenol and methanol is permitted in the finished resin – the same limit value as was used in the previous generation of the criteria. To ensure that the resins have hardened properly, a subsequent requirement is made concerning emissions from the laminate in its finished form.

The exemption for melamine was introduced during the validity period of the previous criteria, since at that time several suppliers began to self-classify it as H361 (Repr. 2). At the end of 2020, ECHA's Risk Assessment Committee (RAC) also agreed that melamine should be given the harmonized classifications H351 (Carc. 2) and H373 (STOT RE 2). The harmonised classifications will become binding on 23 November 2023. The classification H361 will not be a harmonized classification, but there may still be producers who use this self-classification alongside the harmonized classifications once they come into effect. Nordic

Ecolabelling gives an exemption for both the classifications H351 and H361, as there is no substance that can replace melamine at this moment in time. Hazard code H373 is no longer exempted because it is not anymore forbidden hazard code in the requirement.

There is an exemption for UV curing surface treatment products that are classified as environmentally hazardous. UV products have several advantages as they provide a durable surface and contain a low amount of solvents. Later requirements are placed on the amount of VOC applied, which promotes water-based UV products.
UV products contain acrylates, and more and more acrylates are being classified as environmentally hazardous or given stricter classifications. Acrylates and photo initiators are two vital components for UV products to cure. The acrylates change properties in the hardening and bind to the surface coating, so they do not pose an environmental hazard in the finished product. Setting requirements on e.g., the maximum amount of environmentally hazardous substances applied means that only UV products with a lower concentration of acrylates would meet the requirement. This has negative consequences as it leads to longer curing time and more energy-intensive curing. A surface that has not hardened also becomes less resistant and thus offers poorer quality.

In december 2024 was decided on exemption for the hardener in two-component paint/varnish/filler products for classifications as toxic to the environment and/or carcinogenic, germ cell mutagenic and/or reproductive toxicity in category 2, if it can be documented that workers are not exposed (e.g., by using safety equipment when mixing or that the mixing/application takes place automatically without exposure of the workers and that the application of the finished two-component system is done in a closed system). Nordic Ecolabelling generally wants to limit the use of chemicals with these properties as much as possible, but in some cases, it is difficult to find good substitutes. As these are industrial processes that take place under controlled conditions, the worker and the consumer will not be exposed to these substances. Nordic Ecolabelling is aware that there are fillers that cannot meet the chemical requirements for floor coverings, so the requirement including the exemptions make a difference.

Background to requirement O26 Classification of ingoing substances

A ban on CMR Category 2 substances has been added to the requirement. Nordic Ecolabelling would like to restrict the use of substances that are carcinogenic, mutagenic and toxic for reproduction (CMR) to the greatest extent possible. This requirement now represents a further restriction on the classification requirement since it applies to ingoing substances in the chemical product.

An exemption has been made for photo initiators classified with H341, H351, or H361. Photo initiators are compounds that produce radicals when exposed to UV light. Then, these react with monomers and/or oligomers to initiate polymer chain growth. They are essential ingredients of all "modern" UV-curable adhesives, and the industry has not yet found substances that can replace them.

Exemptions are also needed in this requirement for methylene diphenyl diisocyanate (MDI), formaldehyde, and melamine. See more background about this in requirement O6 Classification of chemical products.

In addition, there are exemptions for titanium dioxide (CAS no. 13463-67-7) and 1,1,1-Trimethylolpropane (TMP, CAS no. 77-99-6). Titanium dioxide is a white pigment that is used in many different types of products including being used in almost all pigmented surface treatments. 1,1,1-Trimethylolpropane (TMP) is used to coat titanium dioxide to make the titanium dioxide particles disperse more easily. About 90% of all titanium dioxide is dispersed with TMP. Trimethylolprepane triacrylate (TMPTA, CAS 15625-89-5) has been reclassified as class 2 carcinogen H351. All these three substances are necessary for use in surface treatment products and have recently been classified as CMR category 2, either as a harmonised classification or self-classification. There are currently no good substitutes and exemptions have therefore been given.

The Nordic Swan Ecolabel has included the new CLP classifications to align with the European Green Deal's goal of a toxic-free environment. This inclusion reflects the need to establish hazard identification for endocrine disruptors and addresses criteria for environmental toxicity, persistency, mobility and bioaccumulation. By incorporating these classifications, Nordic Swan Ecolabel ensures that the criteria relate to up-to-date scientific understanding and regulatory compliance. Additionally, the inclusion of PMT and vPvM substances is crucial due to their persistence, mobility and potential impact on water quality. The Nordic Swan Ecolabel aims for comprehensive hazard identification and protection of the environment and human health.

An exemption to volatile aromatic hydrocarbons (VAH) in chemical products have been granted with conditions that they fulfil the requirements O30/O34 set on VOC (including VAH) content. VAH are volatile organic compounds where one or more benzene rings are contained within the molecule, e.g. toluene, benzene and xylene. VAHs are very stable and have a specific impact on the environment and human health, including damage to DNA. Exposure to these products should be minimised. For this reason, no more than 1% by weight is permitted in the chemical product according to requirement O30.

Glyoxal CAS no 107-22-2 is classified as mutagenic cat 2 (H341). Glyoxal is often present in cellulose-based products. There are alternative ways to make technical adaptions to the process which makes it possible to use cellulose without glyoxal, but unfortunately it is difficult to obtain enough of these alternative raw materials, at least at the present time. Therefore an exemption has been made to allow the use of glyoxal, if the pH of the final product is above 7.5. When the pH is above 7.5 in an aqueous solution the glyoxal reacts to irreversibly form glycolic acid CAS no 79-14-1. Glycolic acid is not classified with H341, but is classified H332 and H314. Therefore allowing the use of glyoxal will not generate substance classified with H341 in the final product.

Respirable crystalline silica/quartz is a common impurity found in most mineral fillers, causing the final product to exceed the 100 ppm impurity limit. Silica is classified as STOT RE 1 (H372) and H350i. However, when mixed into wet paint or dry paint film, it is no longer respirable nor poses a health risk. An exemption is made for respirable silica less than 1% in raw materials.

An exemption has also been introduced for the hardener in two-component paint/varnish/filler products if it can be documented that workers are not exposed (e.g., by using safety equipment when mixing or that the mixing/application takes place automatically without exposure of the workers and that the

application of the finished two-component system is done in a closed system). Nordic Ecolabelling generally wants to limit the use of chemicals with these properties as much as possible, but in some cases, it is difficult to find good substitutes. As these are industrial processes that take place under controlled conditions, the worker and the consumer will not be exposed to these substances.

Background to requirement O27 Preservatives

The content of the preservatives bronopol, IPBC, CMIT/MIT and MIT is restricted via specific limit values. The content of the total amount of isothiazolinones is also limited. IPBC is a fungicide that has become more commonly used and the limit value is the same as in Nordic Ecolabelling's Criteria for Chemical building products. Water-based paints and adhesives may contain the preservative bronopol and it is difficult to find substitutes. A limited amount of bronopol is therefore permitted although it is classified as a substance of concern and hazardous to the environment. Isothiazolinones are used as a preservative in many water-based products, where they act as fungicides, biocides and algal growth inhibitors. They are toxic to aquatic organisms and can cause varying degrees of allergic reactions. It has proved difficult to avoid the use of these preservatives in water-based products, which is what Nordic Ecolabelling's criteria for chemicals indirectly promote. Preservatives also play an important role in ensuring the shelf-life of the products before they are used. Alternative preservatives to isothiazolinones include formaldehyde and/or formaldehyde-releasing substances, which are carcinogenic. In this respect, isothiazolinone and CMIT/MIT are better, even though they also exhibit hazardous properties. To limit the use of these substances as much as possible, the amount of the substances is restricted.

Background to requirement O28 Prohibited substances

Candidate List Substances and PBT, vPvB

The ban on substances on the Candidate List, substances that are PBT (Persistent, Bioaccumulative and Toxic) and vPvB (very Persistent and very Bioaccumulative) and the ban on substances that are considered to be potential endocrine disruptors in category 1 or 2 on the EU's priority list of substances for further evaluation of their role in endocrine disruption are new in this revision. The Candidate List contains substances of very high concern, so-called SVHC substances. SVHCs (Substances of Very High Concern) meet one or more of these criteria:

- Very harmful to health: carcinogenic, mutagenic, toxic for reproduction (CMR substances, category 1A and 1B), set out in REACH, Article 57 a, b, c
- Very harmful to the environment: persistent, bio-accumulative and toxic (PBT) or very persistent and very bio-accumulative (vPvB), set out in REACH, Article 57 d, e
- Serious effects to human health or the environment on another basis than the groups above, but that give equivalent cause for concern (e.g. endocrine disruptors and inhaled allergens), set out in REACH, Article 57 f.

SVHC may be included on the Candidate List with a view to later inclusion on the Authorisation List. This means that the substance becomes regulated (ban,

phasing out or some other form of restriction). Nordic Ecolabelling prohibits Candidate List substances due to their hazardous properties. Other SVHC substances are addressed via bans on the use of PBT and vPvB substances, the classification requirements and a ban on endocrine disruptors.

Siloxanes D4, D5 and D6 are included on the Candidate List of Substances of Very High Concern in REACH. However, an exemption has been added for these siloxanes to make it clear that documentation is required to confirm that the content is below the stated limit value in any silicone used. It is possible to find chemicals containing silicone in use throughout the production chain, for example as softeners. The requirement has thus been reworded since the previous generation of the criteria because it used to only cover finishing, membranes, and laminates.

PBT (and vPvB substances) are substances defined in Annex XIII of REACH, which are generally undesirable in Nordic Swan Ecolabelled products.

Endocrine disruptors:

Potential endocrine disruptors are substances that can negatively affect the hormonal balance in humans and animals. Hormones control a number of vital processes in the body and are particularly important for development and growth in humans, animals and plants.

Changes in the hormone balance can have adverse effects, with a particular focus on hormones that affect sexual development and reproduction. Several studies have shown effects on animals that are probably due to changes in the hormone balance. Effluent discharges are one of the major sources of the presence and distribution of endocrine disruptors in aquatic ecosystems[33]. Nordic Ecolabelling excludes identified and potential endocrine disruptors listed on the "Endocrine Disruptor Lists" at www.edlists.org, which is based on the EU member state initiative. Substances listed in Lists I, II and/or III are excluded.

Licensees are responsible for keeping track of updates to the lists so that their Nordic Swan Ecolabelled products fulfil the requirement throughout the entire validity period of the licence. Nordic Ecolabelling recognises the challenges associated with new substances that are added to Lists II and III. We will evaluate the circumstances and possibly decide on a transition period from case to case.

The requirement applies to substances on the main lists (Lists I, II and III) and not to the corresponding sub-lists called "Substances no longer on list". Substances that are transferred to one of the sub-lists and that no longer feature on Lists I–III are not prohibited. However, special attention is paid to the substances on List II that have been evaluated under the Cosmetics Regulation, for example, where there are no specific provisions to identify endocrine disruptors. It is still unclear how these substances will be handled at www.edlists.org after the evaluation (safety assessment of the substances included in cosmetics, for example) has been completed. Nordic Ecolabelling will assess the circumstances for the substances on Sub-List II on a case-by-case

[33] Miljøstatus i Norge (2008) (Environmental status in Norway): Endocrine disruptors. http://www.miljostatus.no/Tema/Kjemikalier/Noen-farlige-kjemikalier/Hormonforstyrrende-stoffer/#D (dated 26 February 2009).

basis, based on the background information provided in the sub-list. By excluding both identified and prioritised potential endocrine disruptors that are under evaluation, Nordic Ecolabelling ensures a restrictive approach towards endocrine disruptors. DBNPA is exempted in all forms used in the production of paints and varnishes or used as an in-can preservative in raw materials or paints and varnishes.

Halogenated organic compounds

Halogenated organic compounds that contain halogens such as chlorine, bromine, fluorine or iodine must not be present in the chemical products used. This includes halogenated flame retardants, chloroparaffins, perfluoroalkyl compounds and certain organic bleaching chemicals. Halogenated organic compounds have various properties that are not desirable in Nordic Swan Ecolabelled products. They are harmful to human health and the environment, highly toxic to aquatic organisms, carcinogenic or harmful to health in other ways. The halogenated organic compounds do not break down readily in the environment, which increases the risk of harmful effects from the substances. A side reaction can occur during the manufacture of epoxy acrylate which results in a small amount of chlorine remaining inside the molecule. The chlorine that is bound in the molecule is relatively stable and will not react further while polymerisation continues. The ban on ingoing substances in the form of halogenated organic compounds applies to the chlorine because it becomes part of the molecule. The quantity of oligomers is normally below 1000 ppm. According to the manufacturers of UV curing chemical products, however, it is not possible to state an exact quantity. Nordic Ecolabelling does not want to ban epoxy acrylate that is used in UV curing chemical products, as such products have multiple environmental benefits. The chlorine in the molecules is not added intentionally for a specific purpose and is therefore exempted. Bisphenol A is also used in the manufacture of epoxy acrylate. It has thus been made more explicit that Bisphenol A used in this manufacturing process is exempt from the requirement.

Perfluorinated and polyfluorinated alkylated substances (PFAS)

Perfluorinated and polyfluorinated alkylated substances (PFAS) are a group of substances with undesirable properties. PFASs are defined as fluorinated substances containing at least one fully fluorinated methyl or methylene carbon atom (without any H / Cl / Br / I atom attached to it), i.e., with a few listed exceptions, all chemicals with at least one perfluorinated methyl group (–CF3) or a perfluorinated the methylene group (–CF2–) is a PFAS as described in OECD 2021.[34] The substances are persistent and are readily absorbed by the body.

PFASs are persistent in the environment and are known to remain in the environment longer than any other artificial substance. This means that as long as PFAS continues to be released into the environment, humans and other species will be exposed to an increasing concentration of PFAS. PFAS substances have often been shown to contaminate groundwater, surface water and soil. Remediation of contaminated sites is both technically difficult and costly. If the

[34] https://www.oecd.org/chemicalsafety/portal-perfluorinated-chemicals/terminology-per-and-polyfluoroalkyl-substances.pdf

release continues, the PFASs will accumulate in the environment, in drinking water and in food.

There is an exemption of the preservatives that fulfil O27 and for pigments fulfilling the EU requirements for pigments in food packaging according to Resolution AP (89) point 2.5. The reason for including a requirement that pigments need to fulfil Resolution AP (89) is that the Nordic Ecolabelling does not wish to allow PCBs at all but since it is not possible to set a zero limit for pigments, the Nordic Ecolabelling has chosen to use the same limit as in food packaging (Resolution AP (89) point 2.5). This level has been chosen since it is a well-known method in the industry and the low level used in food packaging is considered strict enough for floor coverings and flooring underlays. The exemption for these halogenated pigments is needed to make it possible to use products with good colourfastness without choosing pigments with even worse environmental profile.

BHT

Butylhydroxytoluene (BHT, CAS No. 128-37-0) is new to the list of prohibited substances. BHT does not have an official harmonized classification. BHT is included in the EU member state initiative "Endocrine Disruptor Lists", List II Substances under evaluation for endocrine disruption under EU legislation. Nordic Ecolabelling introduces an exemption for UV curing chemical products. BHT has an important function in such products and can be difficult to replace. Nordic Ecolabelling does not want to prohibit the use of UV curing chemical products as they have other positive properties such as low VOC content. If BHT receives a harmonized official classification that is not allowed in these criteria, then the exemption is no longer valid.

Aziridines and polyazidirines

Aziridine and polyaziridines are classified as H350 (carcinogenic) and H340 (mutagenic) and are thus included in the ban on CMR substances. However, they are on the list of prohibited substances to make it clear that they are prohibited. The substances were also on the list for generation 6 of the criteria.

Bisphenols

Based on the potential for widespread use and available information on potential endocrine disruptors, reproductive toxicity and PBT/vPvB properties, 34 bisphenol substances[35] were identified in need for further regulatory risk management in EU[36], and they are therefore prohibited.

Organotin compounds

Organotin compounds are used in biocides and as fungicides in a wide range of consumer products. In the textile industry, they can be found in products such as socks, shoes, and sportswear to prevent odours caused by the breakdown of perspiration. One of the most common organotin compounds is tributyltin (TBT).

[35] Assessment of regulatory needs: Bisphenols. ECHA – 16 December 2021: Section 2.1: Bisphenols for which further EU RRM is proposed – restriction https://echa.europa.eu/documents/10162/c2a8b29d-0e2d-7df8-dac1-2433e2477b02

[36] [2] Annex XV restriction report https://echa.europa.eu/documents/10162/450ca46b-493f-fd0c-afec-c3aea39de487

Several of the tin-organic compounds are banned for selected areas of use through Reach Annex XVII entry 20 and the following three; TBTO, DBTC and DOTE are on the EU Candidate List[37].

Alkylphenols, alkylphenol ethoxylates and/or alkylphenol derivates

Alkylphenol ethoxylates (APEO) and/or alkylphenol derivatives (APD) are a group of non-readily degradable surfactants that are proven endocrine disruptors. APEOs may be present in binders, dispersing and thickening agents, siccatives, foam inhibitors, pigment pastes, wax, etc. Alternatives to APEOs are available based on alkyl sulphates, alkyl ether sulphates and alcohol ethoxylates. These are readily biodegradable but also have harmful properties, being toxic to aquatic organisms and some may be bioaccumulative. However, there is an environmental gain to be made by substitution since they break down rapidly and the degradation product nonylphenol, with its endocrine-disrupting effects, is avoided.

Phthlalates

The ban on phthalates has not been changed. Many phthalates are harmful to the environment and human health and should not be used in ecolabelled products for a variety of reasons. Some phthalates are on the EU's priority list of substances for further evaluation of their role in endocrine disruption, and some have already been identified as endocrine disruptors. Some phthalate compounds are also on the Candidate List. All are there because they are classified as toxic for reproduction. Some are also regulated in Annex XVII of REACH, and many phthalates are on the Danish Environmental Protection Agency's "List of Undesirable Substances" and on the Norwegian Environment Agency's "List of Priority Substances". For precautionary reasons, Nordic Ecolabelling has decided to continue to exclude phthalates as a group.

Additives based on lead, tin, cadmium, chromium (VI) and mercury, and their compounds

Nordic Ecolabelling restricts heavy metals because they are toxic to humans and other organisms, both on land and in the aquatic environment. Mercury, cadmium and lead are toxic to the human nervous system, kidneys and other organs, and the metals can accumulate in living organisms. Chromium (VI) is classified as very toxic, CMR and harmful to the environment.

Background to requirement O29 Nanomaterials

Due to the small size and large surface area of nanoparticles, they are usually more reactive and may have different properties than larger particles of the same material. There is concern among public authorities, researchers, environmental organisations, and others about the lack of knowledge regarding the potential

[37] https://miljostatus.miljodirektoratet.no/tema/miljogifter/prioriterte-miljogifter/tbt-og-andre-organisketinnforbindelser/) besøgt 8 august 2019.

harmful effects on health and the environment[38,39,40,41,42,43]. Coatings and other modifications may also alter the properties. Nordic Ecolabelling takes the concerns about nanomaterials seriously and uses the precautionary principle to rule out nanomaterials/particles in the products. Nanomaterials/-particles are defined according to the EU Commission Recommendation on the Definition of Nanomaterial (2022/C 229/01)[44].

Most nanomaterials on the market today have either been in use for decades, or have recently been manipulated into nanoforms of existing materials[45]. For example, carbon black nanoparticles and amorphous silicon dioxide (SiO_2) have been used in previous centuries. Titanium dioxide (TiO_2), has long been used as a dye in bulk form, but is now manufactured as a nanomaterial for other purposes[46]. Other types of engineered nanomaterials are expected to enter the market in the future[47].

In the construction panel product group, nanomaterials are used, among other things, to impregnate or seal surfaces, in order to create hydrophobic, self-cleaning, and antibacterial surfaces. These effects may, for example, come from the addition of nanometals such as silver, gold and copper or titanium dioxide.

[38] UNEP (2017) Frontiers 2017 Emerging Issues of Environmental Concern. United Nations Environment Programme, Nairobi. https://wedocs.unep.org/bitstream/handle/20.500.11822/22255/Frontiers_2017_EN.pdf?sequence=1&isAllowed=y

[39] Parliamentary Assembly of the Council of Europe (2017 (2013)) Nanotechnology: balancing benefits and risks to public health and the environment. http://semantic-pace.net/tools/pdf.aspx?doc=aHR0cDovL2Fzc2VtYmx5LmNvZS5pbnQvbncveG1sL1hSZWYvWDJILURXLWV4dHIuYXNwP2ZpbGVpZD0xOTczMCZsYW5nPUVO&xsl=aHR0cDovL3NlbWFudGljcGFjZS5uZXQvWHNsdC9QZGYvWFJlZi1XRC1BVC1YTUwyUERGLnhzbA==&xsltparams=ZmlsZWlkPTE5NzMw

[40] Larsen PB, Mørck TAa, Andersen DN, Hougard KS (2020) A critical review of studies on the reproductive and developmental toxicity of nanomaterials. European Chemicals Agency.
40 SCCS (Scientific Committee on Consumer Safety) (2019) Guidance on the Safety Assessment of Nanomaterials in Cosmetics. SCCS/1611/19. https://ec.europa.eu/health/sites/health/files/scientific_committees/consumer_safety/docs/sccs_o_233.pdf

[41] Mackevica A, Foss Hansen S (2016) Release of nanomaterials from solid nanocomposites and consumer exposure assessment – a forward-looking review. Nanotoxicology 10(6):641–53. doi: 10.3109/17435390.2015.1132346

[42] BEUC – The European Consumer Organisation et. al (2014) European NGOs' position paper on the Regulation of nanomaterials. www.beuc.eu/publications/beuc-x-2014-024_sma_nano_position_paper_caracal_final_clean.pdf

[43] Azolay D and Tuncak B (2014) Managing the unseen – opportunities and challenges with nanotechnology. Swedish Society for Nature Conservation. www.naturskyddsforeningen.se/sites/default/files/dokument-media/rapporter/Rapport-Nano.pdf

[44] https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32022H0614(01)&from=EN

[45] EU observatory for nanomaterials and European Chemicals Agency (2019) What are next generation nanomaterials and why are regulators interested in them? Information note. https://euon.echa.europa.eu/documents/23168237/24095696/190919_background_note_next_gen_materials_en.pdf/b9178324-5a69-2e4b-1f2b-aac2c2845f45

[46] European Commission, COMMISSION STAFF WORKING PAPER, Types and uses of nanomaterials, including safety aspects, Accompanying the [..] second regulatory review of nanomaterials, SWD(2012) 288 final

[47] EU observatory for nanomaterials and European Chemicals Agency (2019) What are next generation nanomaterials and why are regulators interested in them? Information note. https://euon.echa.europa.eu/documents/23168237/24095696/190919_background_note_next_gen_materials_en.pdf/b9178324-5a69-2e4b-1f2b-aac2c2845f45

The requirement has the following exemptions:

Pigments

Pigments are finely ground, insoluble particles that are used to give the products a certain colour. There are no substitutes that can perform the function of pigments such as paint dyes, inks, fabric dyes, masterbatch, etc. and many pigments consist entirely or partially of nanoparticles. Therefore, nanosize pigments are exempted. Although clear conclusions on the safety of nanopigments cannot be drawn[48], release by decomposition of facades is very limited and the nanoparticles are probably mainly embedded in the paint matrix rather than released as individual nanoparticles[49,50]. Paint pigments consist of particles of individual crystals up to aggregates of several crystals. It is generally more effective to use pigments with smaller particles than larger to get the same colour. Inorganic pigments used in the paint industry, which can occur in nanosize, include carbon black and iron oxides[51]. Carbon black used in paints is very finely ground and has a particle size of approximately 10–30 nm[52]. Iron oxide pigments can include only nanosize particles, or only a fraction of the particles may be nano. Inorganic nanopigments are also added to products for a number of purposes other than colouring. Nano-titanium dioxide, for example, is used to provide a self-cleaning effect in paint.

Naturally occurring inorganic fillers

Traditional fillers are permitted. Naturally occurring fillers, e.g. from chalk, marble, dolomite and limestone, are exempted from registration in accordance with Annex V, point 7 of REACH, as long as these fillers are only physically processed (ground, sieved and so on) and not chemically modified. An exemption for inorganic fillers has been added as long as they are covered by Annex V, point 7 of REACH.

Synthetic amorphous silica

Silica plays an important role in coating formulations; this is true for non-surface treated types as well as surface modified types. One key functionality of small particle size silica is rheology modification in, for instance, UV-curable wood coatings (e.g prevention of sagging of coating films applied on vertical substrates). A second very important functionality is the optimisation of the film properties, like scratch and abrasion resistance. Finally, adjustment of gloss and efficient matting of coating films can also be obtained by the use of silica particles.

Synthetic amorphous silica (SAS) is an intentionally manufactured silicon dioxide (SiO2) form that has been used in industrial, consumer and pharmaceutical products for decades. SAS is a nanomaterial, under the

[48] Hynes J, Novotný T, Nic M, Kocurkova L, Prichystalová R, Brzicová T, Bernatikova S (2018) Literature study on the uses and risks of nanomaterials as pigments in the European Union. European Chemicals Agency.
[49] Mackevica A, Hansen, SF (2016) Release of nanomaterials from solid nanocomposites and consumer exposure assessment – a forward-looking review. Nanotoxicology, 10(6), 641–653. https://doi.org/10.3109/17435390.2015.1132346
[50] Nowack B, Hincapié I, Sarret G, Larue C, Legros S (2013) Environmental fate of nanoparticles from façade coatings. NanoHouse Dissemination report Nº 2013-03. https:// DOI: 10.13140/2.1.2206.3040
[51] Industrial Organic Pigments; W. Herbst, K. Hunger; Third edition 2004; pp. 120–124
[52] Coatings Handbook; Thomas Brock, Michael Groteklaes, Peter Mischke; 2000; p. 128

European Commission definition and is exempted from the requirement due to a lack of alternative substances.

Polymer dispersions

Polymer dispersions have also been exempted from the requirement. In the follow up report from the EU Commission[53] to the second "Regulatory Review on Nanomaterials" from 2012[54] it is stated that the solid nanomaterials dispersed in a liquid phase (colloidal) shall be considered as nanomaterials according to the EU Commissions recommendation. Nano emulsions are however not covered by the definition. Polymers/monomers can occur in different phases and sizes and is therefore chosen to explicitly mention that polymers are exempted from the definition in paint and varnishes.

Background to requirement O30 Volatile organic compounds

Volatile organic compounds (VOC), including VAH, are of particular concern due to their inherent properties. They can be absorbed through the lungs and skin and cause damage to various organs. Prolonged exposure to certain organic solvents can cause chronic damage to the brain and nervous system, while other organic solvents can cause cancer or reproductive damage. Nordic Ecolabelling therefore limits VOC levels in chemical products. Resin used in the production of laminate is exempted from the requirement, but the laminate must meet later requirements for VOC emissions to ensure that the resin cures properly.

Background to requirement O31 Free formaldehyde

Formaldehyde is a toxic and allergenic substance (H317) that has carcinogenic effects (H351). Some free formaldehyde is permitted as an impurity and in adhesive, as it is difficult to avoid this. The purpose of the requirement is to restrict the content of formaldehyde in products in order to limit formaldehyde emissions. Nordic Ecolabelling does not want to request a specific test for this, because that would be too extensive and costly for each chemical product. Nordic Ecolabelling wants to be able to ask for a test if there is any uncertainty about the declaration.

Most of the formaldehyde present in adhesives occurs as free formaldehyde. However, formaldehyde can also originate from the components in the adhesive (such as preservatives). Adhesives emit formaldehyde during both polymerisation and the curing phase. Free formaldehyde reacts when the adhesive is applied to wood or other components, and when the adhesive has cured/dried formaldehyde can be released through degradation processes. It is possible to control and set requirements for the amount of free formaldehyde in the adhesive, in a mixture or in dried glue, but not for what actually occurs when the adhesive is applied to a surface. This is chiefly because neither the adhesive manufacturer nor Nordic Ecolabelling are able to control or influence the choice of wood/material to which the adhesive is applied.

[53] European commission, COMMISSION STAFF WORKING PAPER, Types and uses of nanomaterials, including safety aspects, Accompanying the [..] second regulatory review of nanomaterials, SWD(2012) 288 final

[54] Communication from the commission to the european parliament, the council and the european economic and social committee, Second Regulatory Review on Nanomaterials, COM(2012) 572 final

4.6.2 Requirements specific to Surface treatments

Background to requirement O32 Application method and quantity applied – surface treatment

Information about applied quantities, number of coats and method of application is required to calculate applied quantities of VOCs in subsequent requirements.

Background to requirement O33 Environmentally harmful chemical products and substances in surface treatments

The various types of floor covering are often surface treated to ensure a durable, easy to clean surface. Wood flooring in particular is often supplied with a surface treatment to ensure a hard-wearing surface, and thus a long service life for the floor. The surface treatment largely takes the form of water-based lacquers, acid cured lacquers, UV lacquers and oils. Within the lacquers there are primers, sealants, undercoats and topcoats that are used alone or together in systems.

The weighting factors for environmentally harmful substances are drawn from chemicals legislation and are a good way of balancing the different degrees of potential environmental harm: H410 is weighted with a factor of 100 since it is the most environmentally harmful, H411 is weighted with a factor of 10 and H412, which is the least environmentally harmful, is multiplied by a factor of 1, i.e., no weighting is applied.

The classification H400, which is acutely toxic to aquatic organisms (not chronically), ought not to be relevant for products for the surface treatment of floor coverings. This classification is used where there is a clear risk of major concentrated emissions on site or where products for industrial cleaning, decreasing etc. reach the drainage system and/or surface water. The classification H413 (suspected harmful to aquatic organisms) is harmful to such a low extent that it has been excluded from the requirement.

UV products contain acrylates, which are being reclassified as environmentally hazardous or receive stricter classifications. The acrylates change properties in the hardening and bind to the surface coating, so they do not pose an environmental hazard in the finished product. Without the exemption, only UV products with lower concentration of acrylates would meet the requirement. This has negative consequences as it leads to longer curing time and more energy-intensive curing. A surface that has not hardened becomes less resistant, which makes the Nordic Ecolabel's quality and durability requirements more difficult to meet.

Furthermore, most of the studies behind the reclassifications of acrylates monomers are conducted by individual manufacturers and lead to a so-called “self-classifications”. “Self-classifications” are to be opposed to harmonised classifications which are legally binding for all manufacturers in the EU. “Self-classifications”, until they become harmonised, can be seen as voluntary scientific contributions. Chemical product manufacturers do not have steerability over these but can choose to bend the rules by buying acrylate monomers from manufacturers not using the same scientific data. In this case, to avoid unfair comparisons between chemical products manufacturers, and because of the

arguments previously mentioned, it was suggested to grant an exemption to acrylate monomers in UV curing systems provided they fulfil the more risk-based requirement included in O25 Classification of chemical product.

Background to requirement O34 Quantity of applied volatile organic compounds (VOC) in surface treatments

The reason for this requirement is that VOCs contribute to the formation of ozone and have adverse health effects in the workplace and the indoor environment. It is possible to document the requirement concerning VOC in surface treatment in two ways – either by measuring or calculating emissions of organic solvents and quantities applied per m^2 surface area (application method).

Application method (g/m^2) forms the basis for calculating the quantity applied in g/m^2, before then determining the content of organic solvents and/or environmentally harmful substances based on the application method and content of (e.g. %) organic solvents and environmentally harmful substances. If the combined VOC content in the applied products, within one surface treatment system, is less than 5%, it is not necessary to conduct the calculation in grams per m^2. The reason for this is that products with such little total VOC content will fulfil the set requirements, and an exemption from the calculation will not reduce the level of environmental protection. It will simply make it easier for both applicants and Nordic Ecolabelling when it comes to processing applications.

4.6.3 Occupational hazard

Background to requirement O35 Emissions to air from production of laminate

Laminate consists of kraft paper and decor paper impregnated with resins containing phenol, formaldehyde and other substances. During the manufacturing process for the laminate, before the resin has fully cured, emissions to air of phenol and formaldehyde occur. The aim of the requirement concerning hygienic limit values for emissions to air in the workplace is to ensure that the air is measured and that levels are low. The limit values are at the same level as the legal requirements in Sweden and Germany, for example, and those set out by the EU Scientific Committee on Occupational Exposure Limits (SCOEL).

Background to requirement O36 Polyurethane

Polyurethane is formed through polyaddition between isocyanates and polyol. The isocyanates that are used for the manufacture of polyurethane foam are MDI (CAS No. 101-68-8) and TDI (CAS No. 584-84-9 and 91-08-7). Both these isocyanates are suspected of causing cancer and may cause sensitisation by inhalation and contact with skin. From an occupational health and safety perspective, MDI is slightly better but gives the foam other technical properties and it is therefore not possible to completely replace TDI with MDI. Among other things, MDI gives the foam a higher density.

Polyurethane as a material is harmless, however if it is heated and reaches a certain temperature, it can start releasing isocyanates and it is important to limit worker's exposure to them. Hence, a description of the safety measures taken to minimise employee's exposure at the polyurethane manufacturing plant is required, and the hygiene threshold limit values for TDI and MDI must be observed. The threshold limit values set in this requirement are the same as

those in the Norwegian Labour Inspection Authority's Regulations on measures and threshold limit values.[55] It is also required that the polyurethane-based floor covering manufacturer sends a description of the safety measures taken when manufacturing the product and when the installer welds it. Isocyanate compounds may only be used in closed processes were recommended/prescribed occupational and health safety equipment is worn.

4.6.4 Energy and Waste

Background to requirement O37 Energy mapping

Because the production of flooring is energy intensive, a requirement has been introduced to push the manufacturers towards reducing their energy consumption. Through energy mapping and energy audits, energy action plans can be implemented to identify issues related to low energy efficiency. They allow to set goals that can be considered as proven energy reduction commitments. By working with certifications of the manufacturing plant in accordance with e.g., ISO 50001, or other acknowledged energy assessment standards, the plant is recognized as working with international climate goals to reduce its energy demand and/or implement energy efficient measures by introducing operational changes.

Moreover, requirement O38 energy consumption demands that a certain quantity of data and information is collected. The collection and its verification by both the applicant and the application handler can become time-consuming. An energy mapping performed by a specialised third party allows trustworthy and efficient data extraction, and open possibilities to set more comprehensive energy requirements in the future.

Background to requirement O38 Energy consumption

The production of floor coverings comprises many steps that can be highly energy demanding and energy consumption is directly linked to the emission of greenhouse gases. Furthermore, whether the energy comes from renewable sources or is of fossil origin can have a great influence on the quantity of emission released into the atmosphere. Increasing the share of renewable energy/fuel used, lowering the overall energy consumption and having an energy efficient production reduces the overall environmental impact of the flooring production by diminishing its contribution to climate change. There is generally high environmental relevance (see RPS analysis) in setting requirements for energy consumption, for both ingoing materials and the final flooring product itself. As the manufacturing processes can differ from a flooring type to another, different limit values to fulfil the energy consumption requirement have been set. This enables direct energy efficiency comparisons between production lines within each flooring type.

The energy requirement comprises two parts. One part contains requirements for the use of electricity, fuel and renewable fuel. The other sets out a certain score that must be achieved in the energy formula. The energy requirement promotes low energy consumption in terms of electricity and fuel through limit values (the maximum fuel consumption has been tightened from 30 kWh/m^2 to 15 kWh/m^2), as well as a minimum fixed share of renewable fuels (25%). Renewable fuel is

[55] https://www.arbeidstilsynet.no/regelverk/forskrifter/forskrift-om-tiltaks--og-grenseverdier/8/1/

defined as non-fossil fuels (peat is not considered to be renewable). In this requirement, no account is taken to purchased "green electricity", i.e., renewable electricity traced with for example Guarantees of Origin or RECs (Renewable Energy Certificates). The reason is that Nordic Ecolabelling has not found enough evidence that purchasing green electricity leads to increased amount of renewable electricity in the energy system.[56,57] However, the requirement can be easier to meet if electricity produced from renewable energy is generated on-site.

The formula is designed such that a maximum total "E" is achieved as follows:

$$E = \frac{A}{20} + \left(5 - \frac{B}{3\ (kWh/m^2)}\right) + \left(5 - \frac{C}{3\ (kWh/m^2)}\right)$$

The E score does not have any unit. The mathematically correct equation can be seen above but has been simplified in the requirement to avoid confusion. Each term/subcomponent may be a maximum of 5. Each subcomponent contributes equally to the total E, making them all equally significant. This means that the lower energy consumption and the higher the proportion of renewable fuel are, the higher the E-score becomes. The functional unit for this product group being 1m^2, the data that must be reported to calculate factors B and C must have for unit kWh/m^2.

The table in Appendix 8 clarifies which processes/steps are to be included in the energy consumption calculations. Since the further back in the supply chain the process is, the lesser the steerability becomes, it was decided to exclude all steps coupled to raw material extraction from the calculations. Meaning that energy consumption of processes associated with wood and crops harvesting as well as oil extraction may be disregarded when performing the calculation. Following the same reasoning, processes occurring at the end of the production line such as surface treatment and packaging must be included, as steerability is considerably higher.

For the sake of harmonization, it is required to include the energy consumption to manufacture the main binder in a plastic flooring or the main binder/HDF in a hybrid flooring. The same way it is required to take into consideration the energy consumption to manufacture the HDF in a laminate flooring or the different wood layer in a parquet into the calculations. However, as energy consumption of the manufacture of bought-out parts/layers that stands for less than 5 w% of the final floor covering may not be included in the calculations, energy consumption for the manufacture of structural and decorative papers in laminate flooring may be disregarded. Energy consumption in the manufacture of chemical products such as adhesives and lacquers may also be disregarded from the calculations.

Underlays are mostly products made from plastic polymers or renewable material such as cork and that is why, the same E-score limit value as the floor coverings of the same materials has been set.

It is often impossible to separate out energy consumption and ascribe it to a particular floor covering, since it applies to the whole factory. This means that

[56] Creative accounting: A critical perspective on the market-based method for reporting purchased electricity (scope 2) emissions - ScienceDirect
[57] https://osloeconomics.no/wp-content/uploads/2018/09/Utredning-om-opprinnelsesgarantier-og-varedeklarasjoner-for-strom.-Endelig-rapport.pdf

the energy consumption data on which the requirement is based, and which is to be used for licensing is an annual average and is not necessarily the specific energy consumption linked to the particular Nordic Ecolabelled floor covering(s). Consequently, this requirement will be fulfilled only by the best factories in terms of energy consumption/efficiency.

Background to requirement O39 Handling of waste and production waste

The requirement concerning waste management includes requirements for generally good waste management. It is based on legislation in the Nordic countries, which discourages the use of landfill. Environmental and commercial/economic drivers steer companies towards material recovery or energy recovery from the waste, where possible. Hence, the waste requirement is judged to be fit for purpose in its revised form.

To further support/acknowledge manufacturers working with management systems, documentation showing that the plant is certified according to ISO 14001 as well as a certificate attesting that the company follow the Eco-Management and Audit Scheme (EMAS).

4.7 Packaging

Background to requirement O40 Packaging

For a ban on chlorinated plastic, see O5 (PVC is also banned in the product). Nordic Ecolabelling does not want metal to be used for packaging as metal production is associated with a large climate and environmental impact. Exceptions are for any staples that can be used to staple cardboard or plastic together. Cardboard and paper can be recycled, but not all types of plastic can. Examples of plastic types where there are good material recycling systems today are Polyethylene (PE), Polypropylene (PP) and Polyethylene terephthalate (PET). Degradable/compostable plastic cannot be recycled in current systems, which means that e.g. PLA plastic cannot be used.

4.8 Use-phase requirements

4.8.1 Emission

Background to requirement O41 Emissions from floor coverings and flooring underlays

The requirement was introduced in the previous generation of the criteria since building materials can have a major impact on the indoor environment of a building. Since underlays are now included in the product group the emissions requirement also applies to underlays.

The requirement states the limits for emissions of TVOC (Total Volatile Organic Compounds), SVOC (Semi Volatile Organic Compounds), formaldehyde and carcinogenic VOC (in line with the EU taxonomy requirements) for different materials used in floorings. In this revision, specific limit values are introduced for hybrid and laminate flooring.

The requirement for formaldehyde emissions from wood-based products are harmonised with the EU Taxonomy requirement. The specified test conditions

refer to in Annex XVII to Regulation (EC) No 1907/2006. However, the use of different test standards in relation to the stated emission value of 0,06 mg of formaldehyde per m^3 (correlation between standards) is still being debated. According to consultation comments and dialog with Eurofins[58], EN 717-1 is the method that follow the parameters. EN 16516 can also be used to show fulfilment of the limit values since but since this method gives a higher test result this can be considered worst case. According to report on comparison of formaldehyde emissions using EN 717-1 and EN 16516 (footnote 62) the conversion factor for using EN 16516 is 1,6. The German legislation regarding emission of formaldehyde from wood-based panels uses a conversion factor when using EN 16516 on 2.0. The difference in conversion factors off cause have a huge effect when setting a specific limit using EN 16516. Nordic Ecolabelling is closely following the ongoing interpretation debate regarding use of test methods and scientifically proven correlation between the 0,06 mg/m^3 limit and test methods. The EU regulation on formaldehyde (EU 2023/1464)[59] new limit values for furniture and wood-based products are 0.062 mg/m^3. The test parameters refer to Annex XVII to Regulation (EC) No 1907/2006 as well.

Except for TVOC limit for solid wood and multi-layer wood and wood veneer flooring, all limit values have been tightened. The tightening is based on a review of results from emission testing of Nordic Swan Ecolabelled products, comments from the public consultation and the limit values of other certification schemes like EU Ecolabel and BREEAM-NOR v.6.0. All TVOC, SVOC and formaldehyde limit values are equal to or below the limit values required for building products by BREEAM-NOR v.6.0 Basic level which is their strictest emission level. This means that all Nordic Ecolabelled wood floorings fulfil the emission requirements from the latest standard BREEAM-NOR v.6.0. Some limit values are also stricter than the M1-certification. Indeed, the M1 level is reached if emissions are lower than 0,16 mg/m^3 (re-calculated from 0,2 $mg/(m^2h)$). Testing of emissions might be done according to the test method EN 16516, ISO 16000-9 or EN 717-1 as in the previous generation of the criteria. Our license holders are using all different methods. Both EN 16516 and ISO 16000-9 methods are also acceptable within BREEAM-NOR v.6.0.

4.8.2 Quality and durability requirements

Background to requirement O42 Product performance – third-party verification

Generally, manufacturers producing products covered by a harmonised standard in accordance with the Construction Products Regulation (EU/305/2011) can document the features and functions for which the products are marketed for, with, for instance, an example of CE marking and a declaration of performance. Indeed, laminate, linoleum and plastic flooring must follow the standard EN 14041:2004 - Resilient, textile and laminate floor coverings - Essential characteristics. However, wood flooring (solid wood, parquet and veneer) must follow the standard EN 14342:2013 - Wood flooring and parquet — Characteristics, evaluation of conformity and marking.

This requirement ensures that manufacturers producing products (e.g., underlays) which are not covered by a harmonised product standard can

[58] Comparison of formaldehyde concentrations in emission test chambers using EN 717-1 and EN 16516 (CEN/TC 351/WG 2), 2020-07-22
[59] https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32023R1464

document the features and functions for which the products are marketed for, on the basis of standardised test results. General requirements for CE marking can be used as guideline.

Background to requirement O43 Quality and Durability of floor coverings

Increasing the service life reduce drastically the contribution from raw material extraction and production phases to the overall environmental impacts of floor covering. Indeed, less resource (oil, water, energy...etc.) is needed if a floor covering must be changed after 20 years, instead of every 2 years. Many parameters can affect the service life of a floor covering and two of them are, of course, the wear resistance of the top layer and the traffic occurring on them. It is worth noticing that the longer the floor covering's service life is, the larger the contribution of the use phase to the total environmental impact becomes (see Circular requirements).

In addition to the standards for general characteristics named in the requirement for CE marking, there are testing methods listed in European/international harmonised standards for the majority of flooring material types. Depending on the results obtained for each relevant parameter to be tested according to the flooring type specific test standard, the floor covering's use class will be determined.

References are made to the latest versions of the standards and test methods. For instance, veneer floorings must be tested according to standard EN 14354. Parquet floorings must be tested according to standard EN 13489. However, because the regular wear resistance test method for parquet considers only the thickness of the wear layer and the wood species used (according to CTBA's classification based on the Brinell hardness test, see appendix 12), it has been deemed relevant to set additional test requirements, notably on the lacquer used. If the parquet is not lacquered (oiled or unfinished), it must be possible to perform sanding and apply a finish if desired. Indeed, to comply with standard EN 13489, a parquet must be capable of undergoing renovation at least twice (see requirement on product information). Overall, it has been difficult to find a complete set of standards ensuring that only the parquet floorings of best quality can be Nordic Ecolabelled. Indeed, manufacturers use their own in-house developed methods coupled with more general measures (e.g., construction stability, cleaning properties and available cleaning products) to guarantee good longevity of their products. That is why, it was deemed relevant to keep thickness of the top layer and harness of the wear layer to ensure good quality and add that the flooring be tested for resistance to chemical agents and its lacquer be tested for its elasticity and against abrasion.

The durability of bamboo floorings is not standardized. In this case, the industry reports the characteristics of the bamboo flooring (test results and test methods) without classifying the flooring. Due to the lack of standards, industry can adapt standards developed for other types of floorings to their necessities (e.g., FprEN 1534) or carrying out their out measurements, leading to different measures that are not comparable. Setting a minimum performance, is therefore, extremely difficult. If there is no harmonised European test standard, such as for bamboo flooring, floor coverings can be tested according to a test method chosen by an independent testing institute with the competence to conduct wear tests on flooring.

The different use classes are listed in the classification standard EN ISO 10874. This way, the use classes give the user a quick overview of the flooring material's durability and suitability for different environments (i.e., different traffic intensity). The use classes are divided into Domestic, Commercial and Light Industrial, with 3-4 intensity levels in each class (see table 2 in Appendix 11).

Nordic Ecolabelling requires that the floor covering at least reaches the use class of 23 if intended to use in private homes or, 32 if used in area with higher traffic.

Background to requirement O44 Quality and Durability of flooring underlays

Underlays, or underlayment, are products installed directly underneath the floor covering and intended to enhance the properties of the whole construction (floor covering + underlays). Through different properties such as, vapour barrier or click support, they can extend the service life of the floor covering. They can also improve the consumer's life quality because of their ability to level out irregularities and their intrinsic sound dampening properties.

As it is also important that the underlays is of good quality, a standard including test methods for many different parameters has been developed. This standard is EN 16354 and is intended for underlays used under laminate floorings. However, several trade associations such as EPLF (European Producers of Laminate Flooring), FEP (European Parquet Federation) and MMFA (Multilayer Modular Flooring Association) has created technical bulletins or guidelines on how to test underlays, all based on standard EN 16354 ("Laminate floor coverings - Underlays - Specifications, requirements and test methods"). These technical bulletins all contain a table that state what requirements and which level can be set. Nordic Ecolabelling set the highest requirements on underlays intended to be used in commercial area while underlays used under a consumer's floor need to fulfil the minimum requirements.

However, the choice of underlay can depend, for instance, on the kind of substrate (concrete, wood-based…etc.) on which the underlay and floor is installed. Meaning, there does not have to be a direct correlation between a specific flooring and a specific underlay product. Moreover, not all trade associations have written their own technical bulletin or guideline on underlays. That is why, for underlays that may be used under plastic or linoleum flooring, there is the possibility of testing according to a test method described in a relevant standard or selected by an independent test institute. Corkment underlays, that are usually used under plastic and linoleum flooring, must follow the standard EN 12455.

Background to requirement O45 Wet room approval

Background

The product information requirement remains unchanged from the previous version, since the requirement is judged to be relevant and fit for purpose. Wet rooms are rooms subjected to water or high relative humidity and are among the most critical rooms in a building, with any imperfections in the waterproofing posing a major risk of moisture damage to surrounding structures. Reliable construction solutions and professional performance are essential for problem-free and waterproof wet rooms.

Alongside industry rules on construction, performance and installation, there is an industry standard for approval of flooring materials and waterproof barriers. Wet room approval and approved labelling can be obtained once a product has been tested and judged to meet the requirements in the national industry standard for plastic flooring in wet rooms.

It is important that the fundamental requirements for wet room approval are fulfilled for flooring intended for use in wet rooms. A new requirement has therefore been introduced, such that plastic flooring marketed and sold for wet rooms is to be tested and approved according to national industry standards. These are stated, for example, in:

- Golvbranschens branschstandard för golvbeläggning av plast i våtutrymmen (The flooring industry standard for plastic flooring in wet rooms) (Sweden).
- Gulvfakta utgiven av Gulvbranchen (Flooring facts issued by the flooring industry) (Denmark).
- Anbefalt Våtromsprodukt från FFV – Fagrådet for Våtrom (Wet room products recommended by FFV – Expert Committee for Wet Rooms) (Norway).

The requirement also states that instructions for proper installation in wet rooms are to accompany the product and be available on the manufacturer's website.

4.9 Circular requirements

Background to requirement O46 Labelling and traceability

As stated earlier in the criteria document, a way to drastically reduce the total environmental impact of a product is to reuse previous resources such as pre- or post-consumer recycled material. A way to guarantee access to known resources of good quality is if flooring manufacturers were able to close the materials loop by taking back their own damaged, or even, worn-out products. Furthermore, by taking back their own products, the producers can either further extend the floor lifespan (through repair) or, remove the most environmentally impactful scenarios from the end-of-use phase (landfill and incineration) if the whole product can be recycled and re-enter the manufacturing process.

There are however many challenges to overcome before a flooring manufacturer can claim to have a fully operational take-back system. The first step that need to be taken is the one guaranteeing full traceability between the product and the manufacturer no matter where or when the flooring is installed. Both time and space parameters add some difficulty. Indeed, floor coverings are intended to have a long service life and can often change ownership especially in some area of use. Finally, there are many actors involved during the whole service life of a flooring and all of them must be informed to ensure that the installed flooring find its way back to the right producer. The fact that some flooring must be glued down, because of higher safety and functionality requirements of some area of use, adds a technical challenge.

To increase the chance of product reuse or recycling of the materials included in the product, certain measures to ensure traceability between the floor

covering/underlays and the manufacturer or license holder must be in place. Labelling renders Nordic Ecolabelled flooring more circular by increasing their chance to find their way back to their manufacturer, despite their long service life.

Background to requirement O47 Warranty and Reparability

For the purpose of undertaking repair and replacement of worn-out parts, the product must meet requirements on warranty and reparability.

A Nordic Swan Ecolabel product must have a good quality, and together with requirements related to durability, warranty is a factor that signals the product's lifetime and says something about what the customer can expect from the product. However, warranty should not be equated with longevity alone, which is affected by many factors, including how careful and often the product is used. A warranty is something that goes beyond the legal warranty and is an agreement between buyer and seller. The legal guarantee is regulated by law in contrast to a warranty. A warranty can be designed in many different ways, but Nordic Ecolabelling has set as a minimum requirement that it must go beyond the legal guarantee and that it must include replacement/repair if something breaks or does not work properly. It is not intended that marks from normal wear and tear should be covered by the warranty. It is important to emphasize that the warranty must cover more than what is covered by the legal guarantee.

The extended warranty of the products should be on the same basis of the mandatory limited guarantee in accordance with the national legislation. Information about the coverage must be indicated and is decided by the manufacturer. The warranty preferably contains information about who is covered, what the consumers responsibilities under the warranties are, what the company will do if any of the covered events occur, what is not covered and what should the consumers do if they have a problem. The warranty may differ depending on the country of sales as it must follow individual national regulations and different warranty times may be provided depending on the product types and their different area of use. Warranty created according to recommendations/guidelines stated by national industry organisations may be assessed as sufficient documentation by the Nordic Ecolabel (see example in Appendix 13).

Requirements for warranty can stimulate manufacturers to make good quality products and choose suppliers who also supply high quality materials and parts. This is important for the product to have a long lifespan.

There are several ways to promote circularity. Processes having the most effects on reducing a product’s overall environmental impact from the end-of-use phase tends to have very tight or short material loops. Indeed, processes such as product reuse, renovate and repair comprise few steps, have few stakeholders involved and do not require the use of a lot of resources (e.g., raw materials, energy or water). That is why, circular design, which is about designing a product so that parts can be replaced or so that the product can be more easily repaired/renovated, has been increasingly used by manufacturers.

In the case of flooring, it has been shown that extending their service life by renovation instead of buying new products (linoleum, plastic and wooden floors) leads from 79% up to 90% CO_2-emission savings and from 90% up to 95% energy-

savings depending on the product type.[60] Furthermore, the report including these results and written by IVL also mentions the lack of incentive actions from different stakeholders to promote refurbishment over purchasing of new floorings. Nordic Ecolabelling requires that a maintenance plan is offered with the purchase of floor covering. Example on how a rough maintenance plan/schedule could look like can be seen in Appendix 14. The maintenance plan can be included in other instruction documents such as the common "Care instructions".

Floorings that are installed in a floating/loose-lay fashion are usually made of individual components (plank or tiles) equipped with a click or an interlocking system that enables easy separation/disassembly and easy removal from the sub-floor. Nordic Ecolabelling requires a copy of the repair document or any other material with the information on design for repair for the floor covering.

Simple illustrations mean mainly sketches or rough drawings. If the consumer does not feel in the position to carry out the replacement, most of the companies that provide floor coverings have a customer service. Information on how to contact the customer service must be included. This requirement, as well as the requirement for warranty, the requirement for labelling and the requirement on product information enable to take into consideration all parameters needed to promote reuse/repair/renovate.

Background to requirement O48 Recyclability

Circular economy does not only mean focus on closed resource loops for the individual product system. Joint circular resource systems may also be the solution. The Nordic Swan Ecolabel shares this approach. Hence, floor covering circularity can be steered by flooring manufacturers not only at the earlier stage of a product's life cycle, i.e., by designing/labelling/tracking, but also at the production phase and above all, at the end-of-use phase by actually taking back used floor coverings. The former can be addressed by having a plan to recover internally the waste generated during production (material recovery or energy recovery in the case of wood-based floorings). The latter implies to take the steps from producing reparable/recyclable products to actually repair/recycle these. Purchase returns, incorrect deliveries and faulty products can be send back and easily handled by the floor producers. However, it can be a challenge to develop a process to transform installation waste and worn-out products (or other post-consumer material) in new resource of sufficiently good quality so it can re-enter the manufacturing process and be part of new floorings or new flooring underlays again.

Floor manufacturers like Forbo, Unilin or Tarkett have already developed processes so that their own torn-out floorings or other post-consumer material can be used to make new floors or manufactured board. In this requirement, it is required that the manufacturers have developed a process enabling transformation of post-consumer material (their own worn-out products) so the obtained recycled material can be included in the production of either new floor coverings, new flooring underlays or other new products of equivalent value. For instance, the worn-out product can be grinded and be included in the back of a new product or, the wear layer of the worn-out product can be separated while the remaining layers can be reused in the manufacturing of a new product. The

[60] https://www.ivl.se/download/18.4c0101451756082fbad78/1603698658279/B2385.pdf

new product does not have to be Nordic Ecolabelled. Pilot projects showing recyclability of the product on a small-scale may be accepted. The collected worn-out products or the obtained post-consumer material may also be sold to other manufacturers that are then responsible for making new valuable products.

Nordic Ecolabelling requires that plastic and linoleum floor coverings manufacturers have developed a process to reuse/recycle installation waste as well as in some cases, post-consumer material (worn out products) to prove they work with material efficiency and contribute to a more circular industry. The services must be communicated to the customer (O49 Product information). Solid wood, multi-layer wood and wood veneer have been exempted from the latter as the recycling possibilities for these products are limited and consequently the resulting environmental benefit as well (they contain much less fossil carbon compared to other product types).

Downcycling is not allowed, and it is up to Nordic Ecolabelling whether this has occurred after the recycling process or not. ISO standard 59004 "Circular Economy – Terminology, Principles and Guidance for Implementation" defines downcyling as recycling activities that obtain recovered resources with a lower value.[61] Downcycling can be defined more generally as the phenomenon of quality reduction of materials reprocessed from waste relative to their original quality. The reduced quality can express itself thermodynamically, functionally and economically, covering all perspectives of downcycling. Dilution, contamination (legacy chemicals), reduced demand for recycled materials, and design related issues can cause those downcycling effects.[62] Nordic Ecolabelling reckons that downcycling has occurred when, for instance, recycled materials from floor coverings or flooring underlays are used in less-demanding applications, such as single-use products (e.g., non-food-contact materials), or in products with lesser functional use (traffic cones, coaster, turf granulates, etc…). Downcycling has of course also occurred if the product's only waste disposal alternative is energy recovery.

Background to requirement O49 Product information

Nordic Ecollabelling knows that the end-user also has steerability. They often have the will to do the right thing from an environmental perspective and that's why, they should be given the possibility to do so. Hence, flooring manufacturers need to inform them of what actions they can make to either, extend the service life of the product, or to dispose of it in the right manner when it is worn out.

This includes technical instructions and recommendations to ensure the good performance of the product, maintenance and cleaning instructions, repair manuals, general customer service information as well as sorting instructions. It is important that the customer is aware of the flooring manufacturer's sustainability work and service purchased with the floor covering. Extended warranty, possibility to repair/renovate through the creation of a maintenance schedule and possibility to use take-back systems must be clearly communicated.

[61] https://www.iso.org/obp/ui#iso:std:iso:59004:dis:ed-1:v1:en
[62] https://www.researchgate.net/publication/360727530_A_terminology_for_downcycling

4.10 Innovation

Background to requirement O50 Innovation

Nordic Ecolabelling sees this requirement as a mean to promote manufacturers who take innovative action and who strive in various ways to reduce the environmental impact of their products in the different life cycle's stages.

The innovations are categorised according to the 3 of the 4 pillars from the environmental platform developed by Nordic Ecolabelling. The four pillars are defined as the four different focus area the Nordic Ecolabelling is striving to write clear, concrete and meetable requirements on. These pillars are "Chemical", "Biodiversity", "Climate" and "Circular economy". For the product group floor covering, the pillar "Biodiversity" is difficultly applicable except when sourcing wood and other renewable raw materials. That is why, it was replaced by "Raw materials".

The floor covering industry is very committed to sustainability. For instance, flooring manufacturers, especially in the Nordic countries, have become a driving force to accelerate the shift from a linear economy to a more circular one. It seems logical to reward their commitment by giving them a hint on what Nordic Ecolabelling might look at in a near future. Two points must be fulfilled, and the manufacturer can decide which measure they wish to fulfil. This offers flexibility. If license holders wish to suggest additional innovation requirements, it is up to Nordic Ecolabelling to assess if they can be accepted and how they can be fulfilled.

5 Licence maintenance

The purpose of the licence maintenance is to ensure that fundamental quality assurance is dealt with appropriately.

Background to requirement O51 Customer complaints

Nordic Ecolabelling requires that your company has implemented a customer complaint handling system. To document your company's customer complaint handling, you must upload your company's routine describing these activities. The routine should be dated and signed and will normally be part of your company's quality management system.

If your company does not have a routine for customer complaint handling, it is possible to upload a description of how your company perform these activities. During the on-site visit, Nordic Ecolabelling will check that the customer complaint handling is implemented in your company as described. The customer complaints archive will also be checked during the visit.

Background to requirement O52 Traceability

Nordic Ecolabelling requires that your company has implemented a traceability system. To document your company's product traceability, you must upload your company's routine describing these activities. The routine should be dated and signed and will normally be part of your company's quality management system.

If your company does not have a routine for product traceability, it is possible to upload a description of how your company perform these activities. During the on-site visit, Nordic Ecolabelling will check that the product traceability is implemented in your company as described.

6 Changes compared to previous generation

- The criteria have been updated so that all requirements set on textile flooring have been removed and specific requirements have been updated or added to include flooring underlays.
- All substances classified as CMR, endocrine disruptor, regardless of the classification category, as well was PBT/vPvB and PMT/vPvM are now forbidden.
- Origin and traceability must now be documented for all raw materials, regardless of if they are virgin or recycled, as well as fossil-based or renewable.
- The product manufacturer must now have an energy consumption reduction and effectivization strategy.
- A new requirement set on product packaging recyclability has been implemented.
- Requirements on warranty, labelling and traceability, reparability and recyclability have been added to increase the products' circularity.
- A new concept of requirement called "Innovation requirements" has been added to reward license holders which have come further in their sustainability work regarding one particular area compared to other license holders or best-in-class on the market.

Below is a short list of the key changes compared with the previous version of the criteria:

Comparison between requirements from generation 7 with requirements from previous generation 6

Proposed requirement gen. 7	Req. gen. 6	Same req.	Change	New req.	Comment
O1 Description of the product and material composition	O1	X			The requirement has been rewritten.
O2 Description of the production chain and the manufacturing process	O1	X			The requirement has been rewritten.
O3 Overview of chemical products				X	New requirement to clarify chemical products used during the manufacturing process.
O4 Share of renewable/recycled raw materials	O2		X		The requirement has been tightened. The limit is still 70% and fillers may still be left out from the calculations again according to alternative c). However the factor promoting the use of renewable materials has been removed.

					Alternative b) has been tightened to promote the use of post-consumer material over pre-consumer material. The limit value is still of 60% but half of it must come from post-consumer recycled material.
O5 Chlorinated plastics in floor coverings and flooring underlays	O3	X			The background text has been updated.
O6 Nordic Swan Ecolabelled laminate and wood-based panels				X	Requirement added to facilitate application handling of laminate flooring.
O7 Tree species – restrictions	O4		X		The requirement has been updated with Nordic Ecolabelling's requirements concerning tree species that are prohibited or restricted. The limit value for PEFC/FSC certified wood fibre has been highered to 70%, with specific temporary exemption for oak parquet.
O8 Traceability and certification	O5		X		The manufacturer of the product is required to be CoC certified.
O9 Chemicals in reused wood and recycled material				X	New requirement for testing of chemicals in recycled wood raw material.
O10 Flax (linen), other bast fibres and linseed oil	O7	X			The requirement has been updated. The requirement has been adjusted so that it is clear it is also set on jute and linseed oil. The requirement is now called O10 Flax (linen), other bast fibres and linseed oil.
O11 Origin				X	Requirement added set on other raw material.
O12 Recycled fibres - test for harmful substances				X	Requirement added set on other raw material.
O13 Chemicals in recycled leather				X	Requirement added set on recycled leather.
O14 Raw materials for bio-based polymers				X	Requirement added set on renewable materials used in the production of polymers.
O15 Emission to water from production of foams	O16	X			The requirement has been updated.
O16 Blowing agents in foams	O18	X			The requirement has been updated.
O17 Rubber, synthetic latex (SBR) and natural latex	O17	X			The requirement has been updated.
O18 Recycled plastic, rubber and foam - Traceability				X	
O19 Chemicals in recycled plastic, rubber and foam	O14	X			Same requirement.
O20 Additives – prohibited substances				X	
O21 Recycled composite				X	
O22 Recycled composite - Additives – prohibited substances				X	
O23 Chemicals in recycled composite				X	

O24 Antibacterial substances	O24	X			The requirement has been updated.
O25 Classification of chemical products	O19	X			The requirement has been updated. The exemption for UV-curng products has been updated. The exemption for accelerators in linoleum has been removed.
O26 Classification of ingoing substances	O20		X		All CRM classifications are now prohibited. The exemption for the hardener in two components product has been reintroduced. An exemption for VAH in requirement 026 Classification of ingoing substances has been introduced and the requirement 030 volatile organic compounds has been updated
O27 Preservatives	O21	X			The requirement has been updated.
O28 Prohibited substances	O22		X		Some more substances and categories of substances are now forbidden.
O29 Nanomaterials	O25		X		The requirement has been updated. The exemption for modified SAS was reintroduced with a slight change to the wording. The exemption is now more specific and only “surface-treated pyrogenic silica” and the surface treatment must meet our chemical requirements.
O30 Volatile organic compounds	O23		X		The requirement has been updated. VAH may be added in 0,1% in adhesives and 1% in other chemical products. VAH in surface treatments is regulated in requirements O33/O34.
O31 Free formaldehyde				X	Additional requirement on formaldehyde to reduce emission from the products.
O32 Application method and quantity applied – surface treatment	O30	X			Same requirement.
O33 Environmentally harmful products and substances in surface treatment	O31	X			The requirement has been updated.
O34 Quantity of applied volatile organic compounds (VOC) in surface treatments	O32	X			The requirement has been simplified.
O35 Emissions to air from production of laminate				X	
O36 Polyurethane	O11		X		Requirement added set on products containing polyurethane.
O37 Energy mapping				X	It is now required that the manufacturer has performed an energy mapping and works according to an action plan.
O38 Energy consumption	O36		X		Multiple changes. The requirement has been adjusted and tightened. More processes are to be taken into account.
O39 Handling of waste and production waste	O37	X			The requirement has been updated.
O40 Packaging				X	

O41 Emissions from floor coverings and flooring underlays	O33		X		The requirement has been tightened. In addition, the accepted test methods have been updated regarding formaldehyde emission.
O42 Product performance – third-party verification				X	Requirement added for products not steered by harmonised standards. Appendix 12 has been simplified to only refer to the relevant standards.
O43 Quality and durability of floor coverings	O38		X		The requirement has been updated and made more comprehensive.
O44 Quality and durability of flooring underlays				X	
O45 Wet room approval	O40	X			Same requirement.
O46 Labelling and traceability				X	
O47 Warranty and Reparability				X	A 5 years-warranty must be given and is coupled to reparability. An appendix has been added to illustrate how an extended warranty can look like. The reparability requirement is set on both glued down and not glued down floor coverings.
O48 Recyclability				X	Linoleum and plastic floor coverings manufacturers must offer that installation waste is material recycled. The manufacturer (wood floorings are exempted) must be able to recycle its own worn-out products and use the post-consumer recycled material into new products. However, downcycling is not allowed.
O49 Product information	O39		X		The requirement has been updated and more information must be provided.
O50 Innovation				X	New concept of requirements.
O51 Customer complaints	Quality and regulatory requirements.	X			
O52 Traceability	Quality and regulatory requirements.	X			

Appendix 1 Laboratories and methods for testing and analysis

General requirements for test and analysis laboratories

Tests must be carried out in a correct and competent way. The analysis laboratory/test institute must be impartial and professional. If accreditation is not separately required, the test and/or analysis laboratory must comply with the general requirements of the EN ISO 17025 standard for the quality control of test and calibration laboratories or have official GLP status.

The applicant's own testing laboratory may be approved for analysis and testing if:

- the authorities monitor the sampling and analysis process, or if
- the manufacturer has a quality management system encompassing sampling and analysis and has been certified to ISO 9001 or ISO 9002, or if
- the manufacturer can demonstrate agreement between a first-time test conducted at the manufacturer's own laboratory and testing carried out in parallel at an independent test institute, and that the manufacturer takes samples according to a set sampling plan.

Test method for COD emissions

COD content shall be tested in accordance with ISO 6060 (Water quality — Determination of the chemical oxygen demand) or equivalent. If another analysis method is used, the licensee must show that it is equivalent. An analysis of PCOD or BOD may also be used as verification if a correlation with COD can be demonstrated. The method for measuring TOC is ISO 8245 Guidelines for the determination of total organic carbon (TOC) and dissolved organic carbon (DOC).

Sample frequency: Emissions to water are calculated as the annual average value and are based on at least one representative daily sample per week. Alternatively, a sampling frequency set by the authorities may also be approved.

Sampling: Water samples must be taken after the process wastewater has been treated in any internal water treatment plant. The flow at the time of sampling must be indicated. If the process wastewater is externally purified with other wastewater, the analysis result should be reduced by the documented efficiency of the COD in the external water treatment plant. The analyses must be carried out on unfiltered and unsedimented samples in accordance with standard ISO 6060.

Working environment – emissions to air

Air measurements must be carried out in accordance with standardised test methods in this area, such as EN 689 Workplace exposure – Measurement of exposure by inhalation to chemical agents – Strategy for testing compliance with occupational exposure limit values; EN 482 Workplace exposure – Procedures for the determination of the concentration of chemical agents – Basic performance requirements; or equivalent method approved by Nordic Ecolabelling. EN 14042 Workplace atmospheres – Guide for the application and use of procedures for the assessment of exposure to chemical and biological agents.

Appendix 4 Directions for forestry certification

Nordic Ecolabelling sets requirements on the standards to which forestry is certified. These requirements are described below. Each individual national forestry standard and each certification system is reviewed by Nordic Ecolabelling as to fulfilment of the requirements. When a forestry standard is revised, it is re-reviewed.

Requirements on forestry standards

The standard must balance economic, ecological and social interests and comply with the Rio Declaration's forestry principles, Agenda 21 and the Forest Principles, and respect relevant international conventions and agreements.

The standard must contain absolute requirements and promote and contribute towards sustainable forestry. Nordic Ecolabelling places special emphasis on the standard including effective requirements to protect the forest from illegal felling and that the requirements protect the biodiversity of the forest.

The standard must be available to the general public. The standard must have been developed in an open process in which stakeholders with ecological, economic and social interests have been invited to participate.

The requirements related to forestry standards are formulated as process requirements. The basis is that if stakeholders agree on the economic, social and environmental aspects of the forestry standard, this safeguards an acceptable requirement level.

If a forestry standard is developed or approved by stakeholders with ecological, economic and social interests, the standard may maintain an acceptable standard. Accordingly, Nordic Ecolabelling requires that the standard balances these three interests and that representatives from all three areas are invited to participate in development of the forestry standard.

The standard must set absolute requirements that must be fulfilled for the certification of the forestry. This ensures that the forest management fulfils an acceptable level regarding the environment. When Nordic Ecolabelling requires that the standard shall "promote and contribute towards sustainable forestry", the standard must be assessed and revised regularly to initiate process improvement and successively reduce environmental impact.

Requirements on certification system

The certification system must be open, have significant national or international credibility and be able to verify that the requirements in the forestry standard are fulfilled.

Requirements on certification body

The certification body must be independent, credible, and capable of verifying that the requirements of the standard have been fulfilled. The certification body must also be able to communicate the results and to facilitate the effective implementation of the standard.

The purpose of certification is to ensure that the requirements regarding forestry standards are fulfilled.

The certification system must be designed to verify that the requirements of the forest standard are fulfilled. The method used for certification must be repeatable and applicable to forestry. Certification must be in respect to a specific forestry standard. The forest must be inspected prior to certification.

Requirements on Chain of Custody (CoC) certification

Chain of Custody certification must be issued by an accredited, competent third party (as for forest certification).

The system shall stipulate requirements regarding the chain of custody that assure traceability, documentation, and controls throughout the production chain.

If recycled fibre, wood shavings or sawdust are used, the pulp manufacturer must verify that this originates from recycled materials.

Requirements on organic production

With regard to certified organic fibre raw material or production that is in the transition to organic production, the vegetable raw materials must be produced and checked in accordance with Council Regulation (EEC) No 2092/91 or 834/2007, or produced and checked in an equivalent way according to an equivalent regulatory system such as KRAV, SKAL, IMO or OCIA.

NB! Bamboo may either be certified according to a sustainable forestry standard or organic production.

Documentation

Copy of forestry/ fibre raw material standard, name, address, and telephone number to the organization who has worked out the standard and audit rapports.

References to persons who represent stakeholders with ecological, economic and social interests who have been invited to participate.

Nordic Ecolabelling may request further documents to examine whether the requirements of the forestry standard and certification system in question can be approved.

Appendix 7, continuation:

Calculation example for the sum of environmentally harmful substances (O33):

The manufacturer of flooring uses three products in the surface treatment system and roller coating technique is used (efficiency rate 95 %).

In surface treatment is used three products with following quantities:
Product A: applied with 10 g/m^2
Product B: applied with 20 g/m^2
Product C: applied with 10 g/m^2

First, the environmental hazardousness is weighted for each surface treatment chemical product according to the weight equation in O33:

Product	Content of env.hazardous substances (%)			
	H410	H411	H412	= weighted env.hazardous content (%) calculated with formula 100*H410 + 10*H411 + H412
A	0	1	0	10
B	0	18	0,5	180,5
C	1	5	1	151

Thereafter the sum of the applied environmental hazardous substances in the surface treatment system is calculated using the above presented weighted content for each product (with consideration taken for the efficacy of the application method). Equation below is used:

$$\text{Applied quantity of respective product (g/m2)} \times \frac{\text{Proportion of environmentally harmful substances in product (\%)}}{\text{Surface treatment efficacy (\%)}}$$

Hence:

Product	Applied quantity (g/m^2)	Weighted env.hazardous content (%), see above	Applied amount env.hazardous substances (g/m^2)
A	10	10	1
B	20	180,5	36,1
C	10	151	15,1
Total application of env. hazardous substances:			52,2 g/m^2
Total application of env. hazardous substances (considering application method efficacy):			54,9 g/m^2

The surface treatment system has therefore applied a weighted total sum env. hazardous substances of 54,9g/m^2 which fulfils the limit value of 60g/m^2.

Calculation example for applied sum of VOC (O34) in surface treatment systems:

The quantity of applied volatile organic compounds (VOC) is defined either by a) calculating the total content of volatile organic compounds (VOC), including VAH, in surface treatment products or alternatively by b) using the equation in the requirement O34.

Alternative a):

Product	**Applied quantity (g/m²)**	**VOC % in product**	**Applied VOC (g/m²)**
A	48	2,42	1,16
B	26	5,39	1,40
C	52	3,86	2,01
Sum	126		4,57
Quantity of applied volatile organic compounds (VOC) total weight % = 4,57/126 = 3,63 %			

The surface treatment system has therefore the total content of volatile organic compounds (VOC) by weight total of 3,63% which fulfils the limit value of 5 %.

Alternative b):

Product	**Applied quantity (g/m²)**	**VOC % in product**	**Roller coating efficiency rate 95 %**	$\text{Applied quantity (g/m2)} \times \frac{\text{Proportion VOC in surface treatment (\%)}}{\text{Surface treatment efficacy (\%)}}$
A	10	0,12	0,95	1,26
B	20	0,01	0,95	0,21
C	10	0,04	0,95	0,42
Quantity of applied volatile organic compounds (VOC) total				1,89

The surface treatment system has therefore the quantity of applied volatile organic compounds (VOC) total of 1,89 g/m² which fulfils the limit value of 2 g/m².

Appendix 8 Declaration of energy consumption

floor coverings/flooring underlays manufacturer:
Name of product:

Indicative list of activities that must be included and may not be included in the calculations of the energy consumption requirement:

Product type	Conditions for the electricity and fuel consumption (indicative list)	
	Included	**Not included**
Solid wood floorings	— drying, grinding and sawing — sizing and trimming — sanding — coating — packaging — and any other activity needed for manufacturing	— activities occurring at the lumber mill (e.g., sawing, edging, trimming, drying and planing of the logs/lumber) and before such as felling and limbing. — manufacture of adhesives, lacquers or any other in-can preparation — manufacture of bought-out parts/layers that stands for less than 5 w% of the final floor covering (for instance, the manufacture of structural and decorative papers in laminate flooring is not to be included). — energy consumed in the quality control activities. — indirect electricity and fuel consumption (e.g., heating outside the manufacturing plant, lighting, internal/external transportation, etc.).
Multi-layer wood floorings	— drying, grinding and sawing — sizing and trimming — sanding — pressing — coating — packaging — and any other activity needed for manufacturing	
Cork and cork tile floor coverings Bamboo floor coverings	— drying, grinding and sawing — sizing and trimming — sanding — pressing — manufacturing of the core board if used in its structure — coating — packaging — and any other activity needed for manufacturing	
Laminate floorings	— manufacturing of the core board — impregnation process of the décor, overlay and backing paper — pressing — sizing — packaging — and any other activity needed for manufacturing	
Linoleum flooring	— oxidation to linoleum cement — mixing — calendaring — drying and curing — finishing — cutting — packaging — and any other activity needed for manufacturing	
Plastic flooring	— manufacturing of the binder(s) — extrusion — mixing — calendaring — finishing	

	— pressing/shaping and cutting — packaging — and any other activity needed for manufacturing	
Others (e.g., multilayer Modular floor coverings, hybrid floorings)	— manufacturing of the core board, binder or any main layer standing for more than 25 % of the final flooring — gluing/laminating/pressing the different elements together — sanding, coating and/or finishing — cutting and shaping — packaging — and any other activity needed for manufacturing	
Underlays	— manufacturing of the final product	

Please declare the following energy data, based on annual average figures. Different delimitations for the energy consumption calculation are relevant for different floor types:

Declare the electricity consumption used in the production of the floor covering or flooring underlays [kWh/MJ] and declare how much renewable electricity is generated onsite (e.g., from solar panels, wind turbine and geothermal powerplant):

_____

_____

Declare the fuel consumption for each fuel type used in the production of the floor covering or flooring underlays [kWh/MJ]:

_____

_____

_____

_____

Declare, if relevant, an energy surplus [kWh/MJ], and declare the production quantity of the floor covering or flooring underlays [m^2]:

_____

_____

Signature of floor covering/flooring underlay manufacturer

Date	Company
Signature by contact person	
Name of contact person	Phone

Appendix 9 Energy content of fuel

The energy content of fuel is calculated based on the table below:

Standard fuel values (1 kWh = 3.6 MJ):

Energy source/ Fuel type	Energy content FIN[1)] GJ/ton	Energy content SE[2)] GJ/ton	Energy content DK[3)] GJ/ton	Energy content NO[4)] GJ/ton	2012/27/EC Energy content* GJ
Petrol	44,3	43,7 (37,8 MJ/l)	43,8	43,9	44,0
Diesel	42,8	43,3 (35,3 MJ/l)	42,7	43,1	
LPG	46,2	46,0	46,0	46,1	45,2
Eo1 oil	42,8	40,6 (35,8 MJ/l, EO-1)	-	43,1	42,3
Eo5 oil	41,1 (sulphur<1 %)	43,1 (40,5 MJ/l, EO-5)	40,65 (fuel oil)	40,6	440,0
Natural gas	36,0 (GJ/1000 m^3)	44,1 (GJ/1000 m^3)	39,55 (GJ/1000 m^3)	40,3 (GJ/1000 Sm^3)	47,2
Power station coal	25,0	27,2	24,23	28,1	28,5
Pellets (7% W)	16,0	16,8	17,5	16,8	16,8
Peat	10,1 - 12,3	9,3 - 12,8 (50 % - 35 % W)	-	-	7,8 - 3,8
Straw (15% W)	13,5		14,5		
Biogas	23,0 (GJ/1000 m^3)		23,0 (GJ/1000 m^3)		
Wood chips (45% W)	10,5		9,3		13,8 (25 %W)
Waste wood	12,0	12,1 (30 % W)	14,7	16,25 - 18 (dry)	

** Energy efficiency directive, 2012/27/EC, Annex IV, «Energy content of selected fuels for end use».*

1) Statistikscentralen i Finland, Fuel classification 2013.

2) Värmeforsk, Miljöfaktaboken 2011.

3) Energistyrelsen, Energy statistic 2012

4) Statistisk Centralbyrå. Notater Documents 30/2013. The Norwegian Emission Inventory 2013.

(% W) is the percentage by weight of water in the fuel and given the letter f in the formulas below. If nothing else is stated, f = 0% W and the ash content is average.

Formula for calculating the energy content of woodchips[63]:

The energy content of woodchips depends on the water content. An example of how to calculate the energy content of woodchips is given below.

[63] Reference: Centre for Biomass Technology, c/o dk-TEKNIK (tel. +45 39 555 999): Videnblad fact sheet 125.2 (in Danish) first published 29 June 1998, revised 26 March 1999.

The energy content of dry wood is 19.0 MJ/kg.

Energy is required to evaporate the water in the wood. This energy reduces the heat value of the woodchips. The energy content can be calculated as:

19.0 MJ/kg – 21.442 * f /100 = MJ/kg, where f is the water content in %W of the wood.

The factor "21.442" is the sum of water's heat of evaporation (2.442 MJ/kg) and the energy content of dry wood (19.0 MJ/kg).

If the applicant can refer to laboratory analyses of the heat value of a fuel, Nordic Ecolabelling may consider using this heat value for calculating the energy content.

Appendix 10 Example of energy consumption calculation

A company produces laminate floorings and wants to apply for the Nordic Ecolabel. The company had installed PV panels several years ago, but additionally it buys gas and biomass every year to provide the production lines with electricity and heat. The consumption of fuels and electricity as well as the energy consumption and production of flooring for the last three years is summarized in the Table below:

Electricity and fuel purchase, production and electricity generation of a company:

Year	Production floor (m^2)	Electricity purchase (kWh)	Renewable electricity generated onsite (kWh)	Fuel purchase	
				Gas (kWh)	Wood chip (t, f=20%)
2020	1 780 685	10 399 200	1 559 880	753230	956
2021	1 856 956	11 036 987	1 655 548	775369	965
2022	1 653 269	9 856 321	1 478 448	725849	949
Average	1 763 637	10 430 836	1 564 625	751483	957

Calculation of B:

The value for the B factor, the annual purchased electricity in kWh/m^2, can be calculated from Table 2: **B** = 10430836/1763637 = **5,9 kWh/m^2**. Indeed, as stated in the requirement O33, the renewable electricity generated onsite is not to be included in the calculation of B. According to the calculation, the value for B is **< 15 kWh/m^2** and meets the requirement.

Calculation of C:

The annual gas purchase in kWh/m^2 is: 751483/1763637 = 0,43 kWh/m^2. The annual wood chips purchase in kWh/m^2 is: (957000*14,7)/(3,6*1763637) = 2,22 kWh/m^2. Indeed, according to Appendix 11 and the standard fuel value for wood chips with a moisture content of 20% is: 19.0 – 21,442*20/100 = 14,7 MJ/kg. The factor of 3,6 is present to convert the value from MJ to kWh. The sum of the fuel purchase in kWh/m^2 is the value to be used as C in the formula: **C** = 0,43 + 2,22 = **2,65 kWh/m^2**. According to the calculation, the value for C is **< 15 kWh/m^2** and meets the requirement.

Calculation of A:

The share of renewable fuel purchased annually is: **A** = 2,22/(2,22 + 0,43) = **84%**. According to the calculation, the value for A is **> 25%** and meets the requirement.

Calculation of E:

Now that all factors have been calculated, E can be deducted: E = (84/20) + (5 – 5,9/3) + (5 – 2,65/3) = 4,2 + 3,0 + 4,1 = **11,3**. According to the calculation, the value for E is **> 10** (limit value for laminate flooring) and meets the requirement.

Appendix 11 Standards for quality and durability testing of floor coverings

Table 1 Standards to be used to test each floor covering type:

Flooring type	Standards/Test method	Classification
Wood veneer floor covering	Flooring must comply with and be tested according to standard EN 14354.	EN ISO 10874
Factory lacquer solid and multilayer wood floorings	Flooring must comply with and be tested according to standard EN 13489. Thickness of the top layer Wood hardness of the surface layer must be tested. * Additionally, at least the following parameters must be tested: - Elasticity of the lacquer according to EN 13696. - EN 13442 Resistance to chemical agents.	EN 685 CTBA*
Factory oiled, uncoated solid wood and uncoated multilayer wood flooring	Flooring must comply with and be tested according to standard EN 13489. Thickness of the top layer Wood hardness of the surface layer must be tested. * Good maintenance instructions and maintenance advice to prolong the lifespan of the flooring must be made available to the customer (see requirement O49 product information).	
Cork tile floor coverings	Flooring must comply with and be tested according to standard EN 12104.	EN ISO 10874
Cork floor coverings	Flooring must comply with and be tested according to standard EN 16511. At least the following parameters must be tested: - Wearing group according to EN 660-1 for wearing group - Effect of a castor chair according to EN 425 - Resistance to furniture leg movement according to EN 425 - Residual indentation according to ISO 24343-1.	
Bamboo floor coverings	Flooring must comply with and be tested according to standard EN 17009 or EN 14354. At least the following parameters must be tested: - Resistance to indentation according to EN 1534 EN - Elasticity of the lacquer according to EN 13696.	– See table in requirement O43 for classification and limits.
Laminate flooring	Flooring must comply with and be tested according to standard EN 13329.	EN ISO 10874
Linoleum flooring	Flooring must comply with and be tested according to standard EN ISO 24011.	EN ISO 10874
Plastic flooring (PVC-free)	Flooring must comply with and be tested according to standard ISO 19322, EN 16776 or EN 14565.	EN ISO 10874
Others (e.g., multilayer Modular floor coverings, hybrid flooring)	Flooring must comply with and be tested according to standard EN 16511 or EN 17142.	EN ISO 10874

** CTBA Revetments interiors Parquet 71.01[64] (see appendix 12).*

[64] https://catalogue-bois-construction.fr/wp-content/uploads/2017/05/Performances-techniques-planchers-et-revetement-de-sol-int%C3%A9rieurs-1.pdf

Table 2 Class of use according to standard EN ISO 10874

Area of use	Use class	Intensity level
Domestic (bedrooms, living rooms, entrance and corridors)	21	Moderate/light
	22	General/average
	22+	General
	23	Heavy
Commercial (hotels, offices, boutiques, schools, halls and department stores)	31	Moderate
	32	General
	33	Heavy
	34	Very heavy
Industrial (assembly, storage rooms and production halls)	41	Moderate
	42	General
	43	Heavy

Appendix 12 Relevant information from standard EN 685 (translation from French)

Classification of wood hardness according to the tree/wood species, and correlations between the use classes in the EN 685 standard and the thickness of the top wear layer depending on the tree/wood species used is found in CTBA Revetments interiors Parquet 71.01.

In Europe, since 1996, the NF EN 685 (or EN ISO 10874) standard identifies classes of use for floor coverings. These classes are identified by number and/or symbol. The tens digit corresponds to the nature of the room: 2 = domestic, 3 = commercial and 4 = industrial. The number of units corresponds to the intensity of the traffic: 1 = moderate, 2 = general, 3 = high and 4 = very high.

In France, this classification has been adopted for parquet floors in the XP B 53-669 standard. As part of the revision of the XP B 53669 standard, a coherent set of characterization of the finish was introduced. Parquet floors not coated with a finish and with a top layer as indicated in the Table below are classified as the following:

Correspondence between tree species hardness classes, minimum top layer thickness and floor coverings classes of use:

Tree species hardness classes	**Class of unfinished parquet floors according to minimum top layer thickness (mm)**			
	≥ 2,5	**≥ 3,2**	**≥ 4,5**	**≥ 7**
A[1)]	21	21	22	22
B[2)]	21	22	23	31
C[3)]	23	31	33	34
D[4)]	31	33	34	41

[1)] Class A corresponds to a hardness between 10 N/mm^2 and 20 N/mm^2. Tree species in this class are notably and conventionally: *Alnus*, *Pinus sylvestris*, *Picea abies* and *Abies*.

[2)] Class B corresponds to a hardness between 20 N/mm^2 and 30 N/mm^2. Tree species in this class are notably and conventionally: *Betula, Guarea cedrata, Larix decidua, Castanea sativa, Prunus avium, Pinus pinaster, Entandrophragma utile* and *Tectona grandis*.

[3)] Class C corresponds to a hardness between 30 N/mm^2 and 40 N/mm^2. Tree species in this class are notably and conventionally: *Pericopsis elata, Dicorynia guianensis, Carpinus, Quercus, Acer, Eucalyptus, Fraxinus, Fagus, Chlorophora excelsa, Tieghemella heckelii, Baillonella toxisperma, Distemonanthus benthamianus, Juglans L.,* and *Ulmus*.

[4)] Class D corresponds to a hardness greater than 40 N/mm^2. Tree species in this class are in particular and conventionally: *Afzelia, Myrocarpus fastigiatus, Handroanthus, Hymenaea, Intsia* and *Millettia laurentii*.

Appendix 13 Example of extended product warranty

The extension of the product warranty must be free of cost and under the same conditions of the legal one.

Example of clauses to be included in the extended warranty (requirement O46)

Extended warranty

1. **Who is covered?**

The extended warranty is given only to the original retail purchaser of the product and is our warranties.

2. **What are you responsible for under extended warranties?**

To be covered under the extended warrant, the consumer needs to retain the sales slip and make sure that the flooring is properly installed in accordance with the installation instruction provided with the flooring. The consumer must also properly care for the new flooring following the maintenance instructions that are provided with the flooring.

3. **What is not covered by the extended warranties?**

The extended warranties do not cover conditions caused by improper use or maintenance, such as a) reduction in gloss, marks, scuffs, scratches, gouges, dents or cuts, including those caused by pets, b) damaged caused by negligence, accidents, misuse or abuse (e.g., dragging object across the floor without proper protection), c) wear caused by pebbles, sand or abrasives…

4. **What should the customer do if s/he has a problem?**

Contact either of the company or the retailers they have agreement with.

5. **Other issues**

The number of years that the extended warranty covers should be indicated. The number of years should exceed five years and depends on the type of floor covering and finish. E.g., residential finish engineered wooden floor coverings can vary between 50 and 15 years depending on the wood used as raw material and the finished applied. Solid wooden floor coverings can be twice and even three types sanding. If done by professionals, this can extend the life of the floorings.

Appendix 14 Example of maintenance schedule

Example of a maintenance plan/schedule for requirement O47

Condition	Action	Incidence for Domestic use	Incidence for Commercial use	Incidence for Highest traffic
− Loose dirt − Bonded dirt − Care	Refresh (follow the maintenance and care instructions provided with the floor covering).	− 1-2 times a week − Weekly − Bi-monthly	− 3-5 times a week − Weekly − Monthly	− Daily − 2 times a week − Weekly
Stubborn stains	Revive (follow the maintenance and care instructions provided with the floor covering). Contact the flooring manufacturer if necessary.	Once a year	3-4 times a year	4-6 times a year
Scratches	Contact the flooring manufacturer to plan maintenance. Recoat is recommended or, Repair (use wax or filler) or Replace the affected part.	Usually after 5-10 years	Usually after 3-5 years	Usually after 2-3 years
Worn	Contact the flooring manufacturer to plan more extensive maintenance. Renew the surface coating or Repair/Replace the broken part is recommended or, Replace the flooring.	Usually after 10 years	Usually after 5 years	Usually after 3 years