About Nordic Swan Ecolabelled

Panels and mouldings for interior use

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Nordic Ecolabelling

Content

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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 Ecolabelled panel and moulding for interior use?

Nordic Swan Ecolabel panels and mouldings for interior use have a reduced environmental and climate impact throughout their lifecycle – and meet strict requirements for recycled materials, chemicals and quality, promoting circular economy.

Nordic Swan Ecolabel panels and mouldings fulfil all requirements for materials in Nordic Ecolabelling criteria for buildings, renovations, floors, as well as furniture and fitments.

Nordic Swan Ecolabelled panels and mouldings for interior use:

- Are made of a high proportion of renewable and/or recycled materials.*
- Wood-based panels consist of wood that is legally harvested under a traceability system. At least 70% of the wood is sourced from certified forestry.
- Meet strict requirements for chemicals used in production and for surface treatment. For example, antibacterial substances and halogenated flame retardants cannot be added.
- Meet strict requirements for emissions of formaldehyde and organic solvents. This is positive for the indoor environment.
- Have a reduced climate impact, achieved by meeting strict requirements for energy consumption.
- Are of good quality and comply with harmonised standards.

* *Except for cement-based panels.*

1 Summary

The structure in generation 7 of the criteria has been changed and panels for external use have been moved to new separate criteria and therefore not part of this revision.

Nordic Swan Ecolabelled panels and mouldings for interior use have reduced environmental and climate impact throughout the lifecycle through procurement of controlled renewable and mineral raw materials and reduced energy consumption. Environmental impact is also reduced using chemicals that meet strict requirements and do not lead to high emission of formaldehyde and organic solvents. Good quality and a longer product life have direct positive effect on the environmental impact. Recycling of panels also minimises negative impacts on the environment when the products has reached its end of life.

The extraction of both renewable and mineral raw materials can have major effects, especially on biodiversity and on the landscape, and the requirement for

the use of certified virgin renewable materials and documented recycled materials has been tightened in generation 7. New requirement has been introduced for responsible sourcing of mineral raw materials such as gypsum, volcanic rocks, silica, and sand.

Energy-efficient production of products is important to reduce the impact on the environment and the climate. Requirements concerning energy consumption have therefore been tightened and divided up per individual type of panel such as MDF, OSB, HPL, gypsum plasterboard or cement-based panels. The manufacturing of cement and mineral wool, which is used in cement-based panels and acoustic panels, uses significant quantities of energy and is a large source of carbon dioxide emissions. Specific energy requirements have therefore been introduced in the production of these two raw materials. Reducing the impact from these raw materials help to reduce the impact that cement and mineral wool has in the lifecycle of a cement-based- or acoustic panel.

The adhesives usually used in the production of wood-based panels and CLT/glulam contain formaldehyde. Formaldehyde is a toxic chemical substance that Nordic Ecolabelling wishes to limit in the working environment and, not least, the indoor climate. The requirement for emissions of formaldehyde from wood-based panels have therefore been aligned with the EU Taxonomy framework. New innovation-requirements also encourage the use of adhesives that are not based on urea-formaldehyde.

The criteria have also been updated from a circular economy point of view, new requirements for high share of renewable raw materials in different types of materials have been introduces. Manufactures of panels must also offer a system for taking back old used panels, faulted products or panels not used in the construction process.

The criteria have been expanded to include cross laminated timber (CLT) and glued laminated timber (glulam) as these products are very similar to wood-based panels. Panels made from recycled composite materials has also been included in the criteria. 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.

For a full description of the changes in the revised generation 7, see the table chapter in section 5.

2 Environmental impact of Panels and mouldings for interior use

Nordic Ecolabelling assesses environmental impacts throughout the product's life cycle. This chapter provides a description of the specific environmental impacts of panels, an RPS analysis and how the product group relates to the UN's Sustainable Development Goals and to the circular economy.

2.1 Environmental impact

This product group consist of many different types of panels with different types of engineering properties manufactured from different types of material. These panels can be used for construction applications such as walls, subflooring and sheathing for roofs and may also have sound-absorbing properties or can be used in furniture. The overall environmental impact for all type of panels[1],[2],[3] is related to:

- Resources/use of raw materials,
- Energy consumption in the production of panels. Energy savings have an important role to play in reducing global warming and climate change,
- Use for chemicals in the production of panels such as gluing and surface treatment,
- Emissions of substances that are harmful to health both during production and use-face,
- Quality,
- End of life.

2.2 RPS

Interior panels and mouldings environmental impact is mainly linked to resources/use of raw materials, energy, and chemical us in the production of panels, emissions of substances during production and use-phase and quality.

In the criteria for panels and moulding for interior use, all significant environmental impacts in the life cycle are assessed. Nordic Ecolabelling has analysed relevance, potential, and steerability (RPS analysis). The purpose of the RPS analysis has been to clarify where the greatest environmental benefit can be achieved by setting requirements. The results (summary) of the analysis are shown in the table below, and they underpin Nordic Ecolabelling's decisions on which areas to assign requirements for interior panels and mouldings and the extent of these requirements. For more details on what an RPS analysis entails, please refer to the Nordic website[4].

Table 1: Summary of results of the RPS analysis. The aspects assessed to have high or medium relevance are those covered by requirements in the criteria.

Lifecycle stages	Area and assessment of R, P, S (high, medium, or low)	Comments
Raw materials		
	Resources - wood raw materials R: High P: High	Wood raw materials used in panels and mouldings has a high RPS. From a life cycle perspective, forestry is a key part of wood products' environmental impact, and it is also important that

[1] Katrine Raunkjær Stubdrup et. al: Best Available Techniques (BAT) reference document for the production of wood-based panels, European IPPC Bureau (2016)
[2] R.sathre et.al: Life cycle assessment of wood based building materials, University of Santiago de Compostela , Spain 2014
[3] Life-cycle assessment summery, Gypsum Association 2013
[4] https://www.nordic-ecolabel.org/nordic-swan-ecolabel/criteria-process/ (accessed 05.07.2022)

	S: High	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 hight share of certified wood raw materials and certified traceability ensures more sustainable forestry.
	Resources - recycled raw materials R: High P: Medium/High S: High	Use of recovered and recycled materials such as renewable fibres or mineral raw materials will reduce the negative environmental impact of all types of panels. Requirements for a minimum proportion of recycled materials in panels will reduce the need for virgin raw materials and thus save natural resources. The potential for using recycled materials is high in most type of panels even though recycled wood raw materials is also requested in the energy sector. A challenge of using recycled materials can be the content of harmful substances. Recycled materials therefor need to be tested in order to reduce the spread of substances of concern and promote the potential of material reuse in the future. The traceability for recycled materials is high due to widespread certification schemes for recycled raw materials.
	Resources - mineral raw materials R: High P: High S: Medium	The R and P for responsible sourcing of virgin mineral raw materials from quarries are high. The mineral industry has been working with both traceability- and biodiversity management and rehabilitation plans for several years. Certification schemes for sustainable mining are however still under development and S has therefor been assessed as medium. The latest assessment of the State of Nature in the EU, published in 2020[5], shows that we are still losing nature as too many protected species continue to decline. The extraction of minerals, particularly by surface methods, inevitably results in changes to the characteristics of the land and local biodiversity where it takes place.
Production/distribution		
	Energy - production of wood-based panels R: High P: Medium/High S: High	High/medium RPS has been identified in relation to energy impact from panel production (production and/or drying of panels). For panels, the production of adhesives and its input raw materials can also have a relatively large effect on the climate impact as it is an energy-intensive process. In panels where paper makes up a high proportion of the material composition, the paper contributes a significant part of the panel's total energy load. Energy savings have an important role to play in reducing environmental impact and thus also global warming and climate change. All panel manufactures are focusing on reducing their energy consumption and therefore the potential to tighten the requirement levels are medium.
	Energy - production of mineral-based panels R: High P: Medium/High S: Medium	Mineral raw materials such as gypsum, mineral wool and cement are used in several types of panels/acoustic panels. In a live cycle perspective, the production of the raw materials (especially mineral wool and cement) has a higher environmental impact compared to the actual manufacturing of the panels. However, the relevance for restricting the use of energy in the manufacturing process is high. The variation in design/function of the different types of panels makes it difficult to set ambitious energy requirements for the individual board type (medium P and S).
	Energy - production of cement	Portland cement being the key ingredient in cement-based panels/acoustic panels and one of the major sources of

[5] https://www.eea.europa.eu/publications/state-of-nature-in-the-eu-2020

	R: High P: Medium/High S: High	emission of greenhouse gasses. Portland Cement accounts for 5% of global carbon dioxide emissions[6], which is due to inputs of high amounts of energy to heat the kilns, with indirect emissions from the energy and direct emissions from the production. Nordic Ecolabel sets out requirements to restrict the GWP on the production of cement to limit the anthropogenic emissions of CO2.
	Energy - production of mineral wool R: High P: Med/High S: Medium/High	Mineral wools are used in acoustic panels due to good properties to absorb sound. Mineral wool production is a high temperature energy intensive process, and the relevance for reducing energy consumption is therefore high. The most important issue when benchmarking mineral wool products is the difference in electricity intensity due to the use of different types of furnaces. The mineral wool industry is focused on reducing its energy consumption and the potential for restricting the energy consumption is therefore medium/high.
	Chemicals used in manufacturing of panels - R: High P: Medium/High S: High	Chemicals used in the manufacturing of panels and possible surface treatment contain many difference substances and raw materials with many different harmful effects on the environment and health. The chemicals requirements apply to all chemical products used in panel production. Here it is assessed that formaldehyde, VOC and isothiazolinones in the binders have the highest relevance. Also securing a low content of problematic chemicals in the surface treatment, e.g., VOC, flame inhibitors, heavy metals in pigments. Also, a high RPS for requirements limiting the use of nano particles, for instance in the surface treatments.
Use phase		
	Quality and properties R: High P: High S: Medium	RPS for securing conformity between the properties and the functions for which the panels are marketed, and the performance declarations drawn up in relation to the CE marking. There is also RPS for ensuring that panels not covered by harmonised product standards also have documentation for the properties and functions for which the panel is marketed.
	Chemicals - emissions of formaldehyde and VOC R: High P: Medium/High S: High	Formaldehyde is a toxic, sensitising, and carcinogenic substances and exposure to VOC vapours can cause a variety of health effects, including eye, nose, and throat irritation. Therefore, high RPS for requirements for formaldehyde and VOC both in the form of reduced formaldehyde/VOC emissions in the use phase and reduced free formaldehyde in the chemical products used, e.g., adhesives.
End of life		
	End of life - take back system. R: High P: High/medium S: Medium/low	Product take-back systems are fundamental for Circular Economy (CE) and focus on recovering value by taking back products to be recycled. High relevance and potential have been identified regarding setting requirements at the end-of-use stage to increase recycling of panels and decrease their incineration. Steerability is however challenged by many parameters such as the choice of the material used in the panels and their recyclability, the long lifespan of panels and the lack of traceability between the installed products and the panel manufacturers. As a result, no panel manufacturers have a fully operational take-back system for worn out panels as of today (Wood-based panels and gypsum plasterboards are already covered by existing waste systems, which means that part of the materials is returned to the panel production again). A requirement is set to ensure that manufactures of panels must also offer a system for taking back old used panels or alternative be in a process/test/pilot face to establish a system for taking back products.

[6] The Cement Sustainability Initiative: https://docs.wbcsd.org/2016/12/GNR.pdf (visited 2022-05-30)

2.3 UN Sustainable Development Goals

On an overall level the Nordic Swan Ecolabel contributes to Goal 12, "Ensure sustainable consumption and production patterns". The Nordic Swan Ecolabel strives to reduce the environmental impact of production and consumption. This ensures sustainable production, control of the supply chain and provides end users with sustainable products. Nordic Swan Ecolabelled products are manufactured all over the world. Wherever the Nordic Swan Ecolabelled product is made, the strict environmental requirements for production go beyond legislation. This promotes more environmentally-friendly production methods – in developing countries too.

The criteria for panels and mouldings for interior use products contribute to Goal 12 as follows:

- Requirements for certified sustainable wood raw material and traceability, energy requirements for drying of wood and/or production of the panel and requirements that stimulate the use of recycled material contribute to sustainable management and efficient use of natural resources.
- Quality requirements and consumer information requirements on maintenance and use promote a longer service life and help to ensure optimum use of resources.
- Restrictions on chemicals that are harmful to health and the environment, which are present in the production of panels and in surface treatments, reduce the spread of undesirable substances and promote the potential for material recovery in the future.
- Restrictions on chemicals that are harmful to health and the environment and emission requirements also contribute to a healthy indoor climate.

Although Nordic Ecolabelling mainly contributes to Goal 12, Target 3.9 is also included. Target 3.9 addresses the reduction of harmful effects caused by chemicals and the reduction of pollution and contamination. Comprehensive and demanding criteria for chemicals, e.g., a ban on chemicals that are classified as environmentally hazardous, carcinogenic, mutagenic, and toxic for reproduction, requirements concerning COD emissions, and other requirements governing emissions from panels and chemicals, e.g., VOC from adhesives and formaldehyde emissions, all contribute towards this target.

2.4 Circular economy and climate

The Nordic Swan Ecolabel is a good tool for promoting a circular economy. The entire product life cycle from raw materials to production, use, disposal, and recycling is assessed in the development of the requirements. This holistic approach to the life cycle is essential for a circular economy. More information about how the Nordic Swan Ecolabel generally contributes to a circular economy can be found on our website[7]. Factors relating to the circular economy are often closely linked to factors that contribute to a reduced climate impact. Both aspects are therefore described below for Nordic Ecolabelling's requirements for panels:

[7] https://www.nordic-swan-ecolabel.org/official-nordic-ecolabel/life-cycle-perspective/ and https://www.nordic-swan-ecolabel.org/official-nordic-ecolabel/life-cycle-perspective/ (visited March 2023)

- The criteria promote the use of renewable, controlled and recovered raw materials, which leads to more efficient and sustainable use of resources. The use of recycled raw materials reduces the need for virgin raw materials and thus saves natural resources.

- Reduced energy consumption cuts greenhouse gas emissions. The criteria therefore set requirements concerning maximum energy consumption in the production of panels and raw materials such as paper. The use of renewable and recycled raw materials also reduces overall energy consumption indirectly, and the impact on the climate is reduced[8].

- Protecting key habitats for biodiversity also helps to reduce the climate impact; for example, forest areas play a role in regulating the climate. There are therefore requirements that ensure sustainable extraction of wood raw material. Also, virgin mineral raw materials must come from mining operations (quarries) with documented biodiversity management and rehabilitation plans.

- Strict chemical requirements lead to the substitution of hazardous substances and avoid the recycling of harmful substances.

- Quality requirements and consumer information/maintenance instructions promote a longer service life and reduce the need for new products. This leads to more efficient use of resources and a reduced climate impact.

- Requirements for take-back system as well as a general use of recycled raw materials promotes circular economy.

2.5 Biodiversity

Biodiversity is the variety of all living organisms on Earth and how they interact. It has a value and is crucial to sustain nature's contributions to people (ecosystem services) and ability to respond to change.

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[9] 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 protecting biodiversity by requiring that renewable raw materials be sustainably sourced. Virgin mineral raw materials must come from mining operations (quarries) with documented biodiversity management and rehabilitation plans. The goal is to counteract loss of species

[8] Extraction and processing raw resources to make usable materials (paper, plastic, or metal) requires a lot of energy. Recycling often saves energy because the production being recycled usually require much less processing to turn them into usable materials.
[9] https://www.unep.org/un-biodiversity-conference-cop-15 (visited February 2023)

and deterioration of ecosystems and that sourcing of biological raw materials is in balance with regeneration.

3 Other labelling schemes and management systems

There are several other labelling schemes operating in the field of construction materials. Of the other Type 1 ecolabels (equivalent to the Nordic Swan Ecolabel) in Europe, Blue Angel has criteria for panels in the criteria "Low-Emission Floor Coverings, Panels and Doors for Interiors Made of Wood and Wood-Based Materials"[10]. Other types of labels in the Nordic market, which often only cover one parameter, are FSC/PEFC (raw materials), M1 (indoor climate) and Dansk Indeklima (indoor climate). In construction products, there are also several manufacturers that have EPDs (Environmental Product Declarations) and Cradle to Cradle certification. There are several building certifications in the Nordic region, such as Sunda Hus, BREEAM and LEED, that set requirements for construction materials.

In addition to voluntary certification schemes, construction products are regulated by the EU's Construction Products Regulation (EU/305/2011). The Construction Products Regulation sets out rules for the sale and documentation of CE marked construction products. The CE mark confirms that the construction product has been manufactured and checked in accordance with a harmonised product standard or a European assessment document. Most types of panels are covered by a harmonised product standard[11].

3.1 Alignment with the EU Taxonomy framework

There are still some uncertainties on how EU Taxonomy compliance can be documented as well as the interpretation. Therefore, Nordic Ecolabelling cannot guarantee EU taxonomy alignment through our criteria for Panels and mouldings for interior use.

Nordic Swan Ecolabel do not take any legal responsibility for the (degree of) alignment, nor can a building material ecolabelled with NSE (or listed in the SCDP) 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 these criteria for Panels and mouldings

[10] Blue Angel: Low-Emission Floor Coverings, Panels and Doors for Interiors made of Wood and Wood-Based Materials, UZ 176, 2013
[11] https://single-market-economy.ec.europa.eu/single-market/european-standards/standardisation-requests_en, visited January 2023

for interior use. Specifically, reference is made to the activity 7.1 "Construction of new buildings":

7.1.5.2: Pollution and prevention control

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 Panels and mouldings for interior use. The requirement for formaldehyde emissions from panels are harmonised with the EU Taxonomy requirement. Nordic Swan Ecolabelling is aware that the specified test conditions referred to in Annex XVII to Regulation (EC) No 1907/2006 has been published. 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.

Nordic Ecolabelling is closely following the development and interpretations of the EU Taxonomy criteria in both the Nordic countries and from EU.

4 Justification of the requirements

This section presents proposals for new and revised requirements, and explains the background to the requirements, the chosen requirement levels, and any changes since generation 6. The appendices referred to in the requirements can be found at the end of the criteria document.

As previously described, the requirements set out in this document are the result of an RPS analysis (see Appendix 4). The requirements are set in the areas where the environmental impact is greatest, Nordic Ecolabelling has good opportunities to set requirements that can differentiate between products on the market, and credible supporting documentation exists.

4.1 Product group definition

Products that may be ecolabelled in this product group must be intended for indoor use. Panels can have different applications such as walls, subfloors, ceilings, as well as being used in the production of furniture and interior design. Panels designed for wet room such as bathrooms is also part of the criteria. The products must fall into one of the categories below:

1. Panels made from renewable raw materials according to EN 13986, classes 1 and 2.

2. Melamine faced boards according to EN 14322

3. Laminate such as HPL (High Pressure Laminate) or compact laminate according to the EN 438 series.

4. Panels and mouldings, either of solid wood or consisting of the panel types indicated in any of the other points.

5. CLT (cross laminated timber) according to EN 16351

6. Glulam (glued laminated timber) according to EN 14080

7. Composite construction panels/boards*

8. Gypsum plasterboard according to EN 520

9. Cement-based panels according to EN 12467

10. Acoustic ceiling- and wall panels** for which the main function is acoustic insulation.

A maximum of 10% by weight of the panel or moulding may consist of materials that are not required by the criteria. This allows panels to contain a limited number of materials for which there are no requirements.

* *Panels consisting of the same composite material or panels consisting of different types of materials glued together.*

** *Panels either part of the wall or ceiling construction or which is mounted directly on walls or ceilings.*

The product group does not include the following products:

- Panels and moulding for outdoor use e.g., façade and cladding. Panels and cladding for exterior use can be labelled according to criteria for 114 Exterior panels and cladding*.

- Panels where the main function is insulation against heat or cold loss.

- Hard covering products such as panels, boards, tiles, clinker made of natural stone, agglomerated stone, ceramic, or precast concrete/cement.

- Acoustic panels which can be installed directly on an office desk or between office desks (partitions) can be labelled according to the criteria for Nordic Ecolabelling for Furniture and fitments*.

- Prefabricated shower walls and partitions walls between showers and toilets can be labelled according to the criteria for Nordic Ecolabelling for Furniture and fitments*.

- Fully prefabricated wall elements e.g., wall systems complete with structural framing, water/air/vapor barrier(s), insulation, and interior/exterior panels.

- Flooring. This can be labelled according to the criteria for Nordic Ecolabelling of Floor coverings*.

- Kitchen and bathroom worktops. These can be labelled according to the criteria for Nordic Ecolabelling for Furniture and fitments*.

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

If there is a desire for ecolabelling other types of panels than those covered by the product group definition, 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.

Nordic Ecolabelling determines whether a product can be Nordic Swan Ecolabelled, and under which criteria a product can apply for a licence.

Background to the product group definition

The revision of existing criteria for building and facade panels only includes panels and mouldings for interior use. The criteria have been split into 2 separate documents: 010 Panels and moulding for interior use and 114 Panels and claddings for external use.

There are several reasons why this has been done. The previous product group definition was very broad and included many different types of panels and materials. The requirements would differ widely depending on the materials that made up the panel, so narrowing the definition will make the criteria more transparent and it will be easier for our applicants to find the right requirements. Products for indoor and outdoor use also have different RPS in key areas such as quality and emissions, which is another reason why Nordic Ecolabelling has chosen to divide them up in two product groups.

The product group definition has been adjusted and expanded with several new types of panels: CLT (cross laminated timber), glulam (glued laminated timber), composite construction panels/boards and panels designed for use in wet rooms. The definition of cement-based panels has been clearer and now covers cement bonded particle boards, fibre-cement boards, and wood wool cement boards. Finally, it has been clarified that only ceiling and wall panels for which the main intended use is acoustic insulation (not thermal insulation) is part of the criteria.

The possibility of labelling CLT and glulam has been added according to the standards EN 16351 (Timber structures – Cross laminated timber) and EN 14080 (Timber structures – Glued laminated timber). There have been discussions about whether they could be Nordic Swan Ecolabelled or not, as they cannot be defined as a panel. However, these products are very similar to wood-based panels in their construction (raw materials and chemicals) and the decision has been taken that these can now be labelled in these criteria.

The possibility to labelling composite construction panels/boards (consisting of the same composite material or panels consisting of different types of materials glued together), has been added to the criteria. All recycled composite material must already be a composite. It is **not allowed** to produce new composite material by mixing pure fractions of different materials, e.g., wood and plastic. The composite material must consist of 100% by weight of recycled material. 50% by weight must be post-consumer recycled.

Gypsum plaster boards have several performance characteristics such as flexural strength (breaking load), impact resistance or reaction to fire and water. Gypsum plaster boards are designed to be used in water/moisture protected environments due to the nature of gypsum. Therefore, it has been clarified that all types of gypsum plaster boards covered by EN 520 is part of the criteria. This means that panels design for wet-rooms, such as wet-room plaster boards, but also other types of wet-rooms panel made from material, are part of these criteria.

Prefabricated shower walls and partition walls between shower and toilets can be labelled according to criteria for Nordic Swan Ecolabelling for furniture and fitments.

Cement is used as a binder in several types of panels such as wood-based panels, fibre-cement flat sheets or wood-wool acoustic panels. Cement must comply with the definition in EN 197-1. The cellulose component varies widely in the different types of panels. Common to all types of cement-based panels are strict requirements for certified wood raw materials and energy use both for the actual production of cement and the production of the various types of panels.

Acoustic panels are made from various types of materials and often marked with insulation characteristics. Panels where the main function is insulation against heat or cold loss is not part these criteria. Only ceiling and wall panels for which the main function is acoustic insulation, e.g., marked as acoustic panel, is part of these criteria.

The product group definition specifies several different types of panels made from different types of materials that can be labelled. A maximum of **10% by weight** of the product may consist of materials that are not required by the criteria. This allows panels to contain a limited amount pf materials for which there are no requirements.

4.2 Terms and definitions

The first time a term is used in the document, it is written in **bold font** or with a reference to this definition list.

Words/Terms	Definitions
ADt	ADt is dry, solid content of pulp and paper. ADt for pulp is 90%, while ADt for paper means a solid content of 94%.
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.
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.
Dry conditions (Service Class 1)	Conditions corresponding to Service Class 1 of EN 1995-1-1 (Eurocode 5) which are characterised by a moisture content in the material corresponding to a temperature of 20ºC and a relative humidity in the surrounding air only exceeding 65% for a few weeks per year.
EPD	A product specific EPD according to the standard ISO 14025 and EN 15804 is a third-party verified document based on product category rules (PCR) and life cycle assessment (LCA).

FDG gypsum	FDG gypsum means gypsum from flue gas desulphurisation. DSG gypsum DeSulphoGymsum.
Fibre-cement flat sheets	Defined in EN 12467
FSC	Forest Stewardship Council Certification scheme for forestry and traceability in the supply chain.
Gypsum plasterboard	Gypsum plasterboard means a gypsum-based core material sold in the form of sheets for the purpose of finishing the interior surfaces of walls, celling, or floor prior to the application of paint, wallpaper, or other coating. Gypsum plasterboard's purpose can also be acoustic. It includes paper-faced, water-resistant, noise-resistant, and fire-resistant and fibre reinforced gypsum board.
Humid conditions (Service Class 2)	Conditions corresponding to Service Class 2 of EN 1995-1-1 (Eurocode 5) which are characterised by a moisture content in the material corresponding to a temperature of 20ºC and a relative humidity in the surrounding air only exceeding 85% for a few weeks per year.
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.
Lignocellulose raw materials	Lignocellulose refers to plant dry matter (biomass), so called lignocellulosic biomass such as straw, hemp, linen, and bagasse
Mineral wool	Insulation wool manufactured from molten rock, slag, or glass
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
VOC	Organic compounds with a steam pressure exceeding 0.01kPa, at 20°C. For products under EU Directive (2004/42/EC) in which steam pressure is not indicated: Organic substances with an initial boiling point that is lower than or equal to 250°C measured at a normal pressure of 101.3 kPa
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. "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.
Self-generated energy	Self-generated energy refers to energy (electricity and heat) not purchased from an external supplier. For example, if the panel production has an energy surplus that is sold as electricity, steam or heat, the sold amount can be deducted from the energy consumption. Internally produced fuel sources and residual products are not regarded as self-generated energy.
Wood based panels	*Example of wood-based panels according to EN 13986:* *Particleboard* *MDF (Medium Density Fibreboard)* *HDF (High Density Fibreboard)* *MFB (Melamine Faced Board)* *Plywood* *OSB (Oriented Stranded Board)* *Flaxboard* *LVL (Laminated Veneer Lumber), structural LVL is CE marked according to EN 14374* *SWP (Solid Wood Panel),* *Cement bonded particleboard*
Wood wool acoustic panels	Defined in EN 13168

4.3 Overview of the requirements

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

Requirement area	Requirement/Material	Requirement	Responsibility for documentation
Description of product and production process	General requirements	O1	Product manufacturer
Quality			
Product requirements	Quality and properties	O2	Product manufacturer
Acoustic panels	Acoustic performance	O3	Product manufacturer
Raw materials			
Wood raw material	Wood, cork and bamboo	O4 O5	Product manufacturer/Subcontractor Product manufacturer
	Recycled wood raw material	O6	Product manufacturer/Subcontractor
Lignocellulose raw materials	Lignocellulose raw materials	O7	Product manufacturer/Subcontractor
Paper	Ecolabelled paper	O8	Product manufacturer
	Raw materials, chemicals, and emissions in manufacturing of pulp and paper	O9-O12	Manufacture Product manufacturer of pulp and paper
Textile/fabric	Ecolabelled textile	O13	Product manufacturer
	Fibres in textiles	O14-O16	Product manager/supplier of textile/fibres
Plastic	Recycled plastic raw materials	O17-O20	Product manager/supplier of recycled plastics
Recycled composite	Recycled composite	O21-O23	Product manufacturer
Mineral raw materials	Responsible sourcing	O24	Product manufacturer

	Heavy metals	O25	Supplier of mineral raw materials
Gypsum	Raw materials	O26	Product manufacturer
Mineral wool	Mineral wool raw materials	O27	Product manufacturer
	Mineral wool raw materials	O28	Manufacture of mineral wool
Metal	Aluminium	O29	Supplier of aluminium
Chemicals			
Chemicals in production	Classification of chemical products	O30	Manufacturer/supplier of chemical product
	Classification of ingoing substances	O31	Manufacturer/supplier of chemical product
	Prohibited substances	O32	Manufacturer/supplier of chemical product
	Antibacterial substances	O33	Product manufacturer and manufacturer/supplier of chemical product
	Nanomaterials	O34	Manufacturer/supplier of chemical product
	Preservatives	O35	Manufacturer/supplier of chemical product
	VOCs in adhesives	O36	Manufacturer/supplier of chemical product
	Free formaldehyde	O37	Manufacturer/supplier of chemical product
Chemicals – surface treatment	Plastic foiling	O38	Product manufacturer
	Classification of chemical products	O39	Manufacturer/supplier of chemical product
	UV curing surface treatment system	O40	Supplier/performer of surface treatment
	Classification of ingoing substances	O41	Manufacturer/supplier of chemical product
	Prohibited substances	O42	Manufacturer/supplier of chemical product
	Antibacterial substances	O43	Product manufacturer and manufacturer/supplier of chemical product
	Nanomaterials	O44	Manufacturer/supplier of chemical product
	Preservatives	O45	Manufacturer/supplier of chemical product
	Free formaldehyde	O46	Manufacturer/supplier of chemical product
	Application method and quantity applied – surface treatment	O47	Supplier/performer of surface treatment
	Volatile organic compounds (VOC)	O48	Supplier/performer of surface treatment
Emissions			
Emissions from product	Formaldehyde and VOC emissions	O49	Product manufacturer
Emissions from production – COD	Emissions of COD from wet processes	O50	Product manufacturer
Emissions from production – working environment	Emissions to air from production – HPL and compact laminate	O51	Laminate manufacturer
	Emissions of dust	O52	Product manufacturer
Climate and energy			
Pulp and paper	Pulp and paper production included in HPL and compact laminate	O53	Manufacturer of pulp and paper

Laminate	Laminate	O54	Laminate manufacturer
Wood-based panels	Wood-based panels	O55	Panel manufacturer and wood suppliers (drying process)
Panels from lignocellulose raw materials	Panels – other lignocellulose raw materials	O56	Product manufacturer
CLT and glulam	CLT and Glulam	O57	Product manufacturer and wood suppliers (drying process)
Solid wood panels and mouldings	Solid wood	O58	Product manufacturer and wood suppliers (drying process)
Recycled composite	Panels made from recycled composite	059	Product manufacturer
Gypsum plaster boards	Gypsum plaster boards	060	Product manufacturer
Mineral wool	Stone- and glass wool	O61	Manufacturer of mineral wool
Mineral wood-based panels	Mineral wood-based panels - acoustic panels	O62	Product manufacturer
Cement	Cement	O63	Manufacturer of cement
Cement-based panels	Cement-based panels	O64	Product manufacturer
Panels made of other materials	Panels made of other materials	O65	Product manufacturer
Circularity			
Information to costumer	Information	O66	Product manufacturer
Maintenance	Maintenance	O67	Product manufacturer
Take back system		O68	Product manufacturer
Innovation			
	Innovation requirements	O69	Product manufacturer
Other requirements			
	Maintenance of the Nordic Swan Ecolabel licence	O70–O71	Product manufacturer/licensee

4.4 Product information

This chapter contains product specification such as description of the product, material composition and production methods/process.

Background to requirement O1 Description of the product

The purpose of the requirement is to give information on the product, material composition, description of the production method and treatment techniques. Panels and moulding can have different functions and be produced from different types of materials, technics, and production sites. To provide traceability for the Nordic Swan Ecolabelled panel or moulding, all activities must be described. Product data sheets or equivalent information must be included in the application.

4.5 Quality

Background to requirement O2 Quality and properties

The purpose of the requirement is to ensure a correlation between the features and functions that the product is marketed, and the declaration of performance

prepared in accordance with the Construction Products Regulation[12]. At the same time, the requirement must ensure that construction panels and other products not covered by a harmonised product standard can document the features and functions with which the product is marketed, based on standardised test results.

Background to requirement O3 Acoustic panels, acoustic performance

This is a new requirement in generation 7.

The material's ability to absorb sound is generally presented with absorption coefficients measured in different frequencies. This means in practice that one material has several different absorption coefficients based on frequencies. EN ISO 11654 is used to classify the sound absorption materials based on the measured absorption curves to categories from A to E. Class A has the best ability to absorb sound, and E has the weakest.

The requirement for minimum absorption class B secure that only acoustic panels with extremely- and highly absorbing properties comply with the requirement. Nordic Ecolabelling is aware that buildings and spaces may have different requirements regarding acoustic, and therefore the absorption class system is not the only relevant acoustic performance parameter. Therefore, acoustic panels which are marked with alternative main acoustic features a purpose such as specific frequency tuning or reverberation time for use in e.g., sound studios, concert halls, theatres, cinemas, conference room and classroom does not need to achieve sound absorption class A or B, but the sound absorption class must be stated.

4.6 Raw materials

The requirements in this chapter concern requirements for raw materials used in panels and mouldings.

The requirements only apply to raw materials that are included by **more than 5 wt-%** of the panel.

Panels consisting of different types of raw materials need to comply with the specific raw material requirements e.g., a wood wool acoustic panel must comply with requirements for wood raw materials and cement.

4.6.1 Wood raw materials

Background to requirement O4 Prohibited and restricted tree species

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

[12] https://single-market-economy.ec.europa.eu/sectors/construction/construction-products-regulation-cpr_en (visited March 2023 such as specific frequency tuning or reverberation time for use in e.g., sound studios, concert halls, theatres, cinemas, conference room and classroom)

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 panels, mouldings and glulam 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 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. Now, 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.

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.

Exemptions:

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 several 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 several articles in 2018[13],[14] and by redd-monitor.org in 2019[15]. Greenpeace International has terminated its membership of FSC because the certification body no longer fulfils its goals of protecting forests and human rights[16]. 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

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

Landscape (IFL), as defined by Intactforest.org in 2002[17]. Intact forest has monitored IFL areas since 2000 and has developed an updated online map tool 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. 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 O5 Traceability and certification

The requirement has been tightened and it is now required that the manufacturer of the Nordic Swan Ecolabelled product must hold Chain of Custody certification (or only use recycled raw material). The certified share has increased to 70%, while the remainder must be covered by the CoC system and be controlled wood/from controlled sources. Alternatively, recycled material can be used.

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, sustainable 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

[17] http://www.intactforests.org/world.webmap.html, accessed January 2020

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.

Particle boards are often made from a high share of recycled wood raw materials from either primary industry e.g., sawmills or post-consumer wood raw materials. However, due to the uncertain energy situation in Europe possible use of virgin wood raw materials is a real alternative. To prevent that particle boards are made from 100% virgin wood raw materials, a minimum of 50% of the wood raw material in Nordic Swan Ecolabelled particleboard are to be recycled raw material (both pre- and post-consumer recycled materials). The requirement level of min. 50% is based on dialog with stakeholders after consultation. In the next generation of the criteria NSE will investigate the possibility to require a minimum share of post-consumer recycled materials in the particle boards.

Particle boards also still need to comply with the requirement for: a) minimum 70% wood material from forests that are managed in accordance with sustainable forestry management principles established by FSC and PEFC and/or be recycled raw material and b) the remaining proportion of wood raw material in the particle board must be covered by FSC/PEFC's control schemes (FSC controlled wood/PEFC controlled sources) or be recycled material. This ensures that the panels comply with rules for public consultation in e.g., Denmark.

Background to requirement O6 Chemicals – recycled material in wood-based panels

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. 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 several heavy metals, fluorine, chlorine and PCB. It has been clarified that creosote is regarded a substance used for wood preservation. 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. Alternative, test can also be done on the final product/panel with test reports from the manufacturer of the panel.

4.6.2 Lignocellulose raw materials (other than wood)

This requirement concerns panels made from lignocellulose raw materials such as straw, flax or hemp.

Background to requirement O7 Lignocellulose raw materials (other than wood)

Nordic Ecolabelling is positive about the use of renewable materials but wishes to receive information about the species used and 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 or residual products from other production.

4.6.3 Paper and cellulose fibre

The requirements in this chapter comprise raw materials, chemical and emissions in production of pulp and paper used in panels. Pulp and paper are used in several types of panels such as kraft- and decor paper used in HPL/ compact laminate, layers of paper in gypsum plaster boards and sound absorbing material in acoustic panels.

Bagground to requirement O8 Ecolabelled paper

Nordic Swan Ecolabel and EU Ecolabel are so called type 1 ecolabels and both schemes assess the entire life cycle of the paper and target requirements at the stages in the life cycle that have relevance and potential.

Background to requirement O9 Prohibited and restricted tree species (pulp and paper)

Se requirement O4.

Background to requirement O10 Traceability and certification of wood raw materials (pulp and paper)

The requirement has been tightened and it is now required that the manufacturer of the Nordic Swan Ecolabelled product must hold Chain of Custody certification (or only use recycled raw material). The certification share has increased to 70%, while the remainder must be covered by the Chain of Custody system and be controlled wood/from controlled sources. Alternatively, recycled material can be used.

Background to requirement O11 Chemicals in the manufacture of pulp and paper

Nordic Ecolabelling has long experience of setting requirements for paper production. The requirements to be met have recently been revised and the result is the chemical module generation 3 to produce pulp and paper. The chemical module contains, among other things, requirements for the classification of chemicals, specific requirements for classified residual monomers and a ban on GMO in starch. For more background, please see the background document for the Chemicals module which can be found on the Nordic Ecolabelling website.

Background to requirement O12 COD emissions from the production of paper and pulp

The requirement was also included in generation 6 of the criteria and remains unchanged. All pulp and paper production generate wastewater with organic content expressed as chemical oxygen demand (COD). Microorganisms consume oxygen to break down the organic matter. This may lead to low oxygen concentrations in the water and, in some cases, anaerobic conditions. The Nordic Swan Ecolabel's basic module for paper also contains requirements concerning other emissions, such as emissions of nitrogen and phosphorus. However, requirements are only set for COD. COD emissions also correlate with other emissions. If the emission of COD is low, emissions of other substances to water are thus also expected to be low.

4.6.4 Textile fibre

The requirements apply to textile/textile fibre used as an outer layer on the panel or textile fibre used as sound absorbing material in the panel. Textile fibre can be made from both natural and synthetic fibres such as cotton, viscose, silk, polyester, and wool used in panels.

Background to requirement O13 Ecolabelled textile

New requirement in generation 7.

Nordic Swan Ecolabel and EU Ecolabel are so called type 1 ecolabels and both schemes assess the entire life cycle of the textile and target requirements at the stages in the life cycle that have relevance and potential. Textile products may comprise different fabrics with totally different production chains. The requirements for the textile used are comprehensive in these criteria. The choice has therefore been made to permit the use of the other stated certifications to make the application process easier. Nordic Swan Ecolabel and EU Ecolabel covers both cotton/natural fibres of cellulose and synthetic fibres.

Background to requirement O14 Cotton, other natural seed fibres of cellulose or woll

New requirement in generation 7. The cultivation and harvesting of cotton are associated with serious environmental and health problems. This is mainly caused using pesticides, fertilisers, and other chemicals during cultivation. Other factors, such as water consumption (irrigated or rainwater), monoculture, land use also have significant impacts on the environment[18].

There are several ways to reduce adverse effects on health and the environment in the production of cotton. Integrated Pest Management (IPM) promotes measures such as the use of personal protective equipment, training farmers in the use of pesticides, and improved control of the pesticides used. A reduction in the use of artificial fertiliser and energy is also a requirement.

The environmental impact can also be reduced through organic cultivation and farming that does not use synthetic pesticides or artificial fertilisers and does not allow genetically modified cotton. One of the environmental problems that organic production does not solve is the problem related to artificial irrigation. Organic cultivation today is primarily located in areas where rainwater is the main source of water, which reduces the problems associated with water consumption[19]. Although organic production does not necessarily result in reduced water consumption, the run-off water quality will be significantly better for both humans and nature. It is difficult to say whether there is any difference between cotton yields in conventional and organic production. One of the reasons for this is that yields already differ greatly within individual systems. Various

[18] Revision of the European Ecolabel and Green Public Procurement (GPP) Criteria for Textile Products – Technical report and criteria proposal, Working document, European Commission, Joint Research Centre Institute for Prospective Technological Studies (IPTS) 2013.
[19] "The sustainability of cotton – consequences for man and the environment", Kooistra K., Termorshuizen A and Pyburn R., Wageningen University & Research Center, report no. 223, April 2006

studies suggest that IPM produces the highest yields of the three production methods and that approx. 20% of global cotton production is IPM[20].

Recycled cotton fibre:
This is cotton fibre that is recovered from used clothing and textiles from consumers or industrial waste (post- or pre-consumer textile waste). Industrial textile waste may be surplus material from the production of yarns, textiles, and textile products, for example selvedge from weaving and fabric remnants from factory cutting rooms. The textiles are stripped and pulled into fibres, which are then carded and spun into new yarn. Recycled cotton may also be blended with virgin fibres to improve yarn strength[21].

GMO:
GMO is a highly debated topic, and several countries have banned cultivation of GMOs. Topics discussed are food security, land use, lack of scientific knowledge about effects under local agricultural/forest conditions and risk of adverse effects on health and the environment.

Nordic Ecolabelling emphasises the precautionary principle and bases its position on regulations that have a holistic approach to GMOs. This means that sustainability, ethics, and benefit to society must be emphasised together with health and the environment. We are not in principle against genetic engineering and GMOs per se but are concerned about the consequences when genetically modified plants, animals and microorganisms are propagated in nature. Nordic Ecolabelling believes that GMOs should be assessed on a case-by-case basis.

Background to requirement O15 Synthetic fibres

Nordic Ecolabelling wants to support the circular economy using recycled materials instead of virgin materials, which in this case is crude oil. However, fibre to fibre recycling is still limited for textiles[22] 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. There are reasonable opportunities for using recycled fibre types like polyester and polyamide today. The opportunities for other fibre types are not yet quite the same (August 2019).

The article “Environmental impact of textile reuse and recycling - A review”[23] reports that it is well documented that textile reuse and recycling in general minimises negative impacts on the environment compared with incineration and landfill, and that reuse is more beneficial than recycling.

There is a ban on the use of re-granulate that is approved for contact with foods by the EFSA under Regulation No. 282/2008 or FDA in compliance with Code of Federal Regulations Title 21: Food and Drugs, PART 177—INDIRECT FOOD

[20] Revision of the European Ecolabel and Green Public Procurement (GPP) Criteria for Textile Products – Technical report and criteria proposal, Working document, European Commission, Joint Research Centre Institute for Prospective Technological Studies (IPTS) 2013.
[21] Wikipedia - Cotton recycling, https://en.wikipedia.org/wiki/Cotton recycling (accessed 26.08.2019)
[22] PULSE OF THE FASHION INDUSTRY, Global Fashion Agenda & The Boston Consulting Group 2017
[23] Sandin, G, Environmental impact of textile reuse and recycling – A review, Journal of Cleaner Production Volume 184, 20 May 2018, Pages 353-365 70 EU Ecolabel’s background report; “Establishment of ec

ADDITIVES: POLYMERS. It is considered inappropriate that raw materials which are approved for production of food packaging should be used in the production of textiles. The highest levels of traceability and purity are required for plastic raw materials used in packaging in contact with food. The use of these plastics for anything other than food contact is therefore downcycling.

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. Documentation regarding traceability should be available, e.g., a certificate from a third party's certification of the supply chain, such as Global Recycled Standard.

The requirement for minimum 50% post-consumer recycled materials is based on dialog with stakeholders after the consultation.

Background to requirement O16 Fibres test for harmful substances

The requirement is new and is based on requirements in the criteria for the Nordic Swan Ecolabelling of furniture.

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[24]. This applies to both fibre recovered from used textiles and fibre recovered from products other than textiles. Even if the textile is washed several times, unwanted chemicals may still be present in the recycled fibre. 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[25]. 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 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[26].

[24] 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
[25] Nordic Council of Ministers (2016). Gaining benefits from discarded textiles: LCA of different treatment pathways
[26] M. Whitt, Survey of heavy metal contamination in recycled polyethylene terephthalate used for food packaging, Journal of Plastic Film & Sheeting 2012

4.6.5 Plastic

The requirements in this chapter comprise plastic used in panels e.g., face sheets, layers/membranes or core material used for sound absorbing such as expanded polystyrene (EPS), extruded polystyrene (XPS), polyisocyanurate (PIR) or Polyurethane (PU). Polyester made from recycled plastic must comply with requirements for textile fibre in section 4.6.4.

Background to requirement O17 Plastic

This is a new requirement in generation 7. Nordic Ecolabelling wants to support the circular economy using recycled materials instead of virgin materials, which in this case is crude oil. This helps to reduce both the general environmental impact and the more specific energy and climate impact of the product.

The requirements for minimum share of recycled materials are based on dialog with several stakeholders and is identical to similar requirement in criteria for Nordic Swan Ecolabelling furniture, gen. 6.

There is a ban on the use of re-granulate that is approved for contact with foods by the EFSA under Regulation No. 282/2008 or FDA in compliance with Code of Federal Regulations Title 21: Food and Drugs, PART 177—INDIRECT FOOD ADDITIVES: POLYMERS. It is considered inappropriate that raw materials which are approved for production of food packaging should be used in the production of plastics. The highest levels of traceability and purity are required for plastic raw materials used in packaging in contact with food. The use of these plastics for anything other than food contact is therefore downcycling.

A ban on PVC is a requirement that Nordic Ecolabelling includes in many criteria. The environmental impact of PVC is associated primarily with waste management, the use of additives and dioxin emissions, for example in the manufacture and incineration of PVC. The latest membrane cell technology is considered to be the most environmentally-sound means of production, but the membranes are coated with PFAS, and this represents a potential source of PFAS contamination to the environment[27],[28]. The mercury method is still used to produce chlorine at some production facilities[29].

Plasticisers that have adverse health and environmental effects, such as phthalates, are frequently added to PVC. So-called imitation leather can be coated with plasticised PVC[30]. Some consultative bodies have commented that PVC is necessary for furniture for the health sector. However, there are other consultative bodies that have pointed out that there are alternatives to PVC such

[27] Chlorine and Building Materials: A Global Inventory of Production Technologies, Markets, and Pollution, Phase 1: Africa, The Americas, and Europe
[28] Chlorine and Building Materials: A Global Inventory of Production Technologies, Markets, and Pollution, Phase 2: Asia, Healthy Building Network, 2019
[29] The Danish Environmental Protection Agency, Green Tips for Furniture: https://mst.dk/kemi/kemikalier/saerligt-for-borgere-om-kemikalier/groenne-tips/hjemmet/moebler-udenpvc-og-phthalater/ (downloaded 10 October 2019)
[30] The Danish Environmental Protection Agency, Green Tips for Furniture: https://mst.dk/kemi/kemikalier/saerligt-for-borgere-om-kemikalier/groenne-tips/hjemmet/moebler-udenpvc-og-phthalater/ (downloaded 10 October 2019)

as PU. The ban on PVC is in line with requirements in other type 1 ecolabels such as EU Ecolabel and Blauer Engel in Germany.

The requirement for polymer-based insulation materials (XPS, EPS, PIR, and PU) is ambitious and manufactures may have difficulty finding appropriate recycled materials to use as feed stock. However, the development in the market is moving towards a greater share of recycled materials in the polymer-based insulation materials. Some materials are marketed with different shares of recycled materials.

Background to requirement O18 Chemicals in recycled plastics

The requirement is new and corresponds to requirements set in the new criteria for Nordic Ecolabelling of furniture.

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 O19. 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". Ways of documenting this were assessed during a review of the floor covering criteria and as part of an internal investigation by Nordic Ecolabelling in connection with amendments to the requirement applicable to plastics in Version 4 of Furniture and fitments. After the consultation 8 specific polycyclic aromatic hydrocarbons (PAH) has been added the requirement. All 8 PAHs is listed in annex XVII in REACH due to concerns risks to human health. PAHs have been found in plastic packaging made of recycled PCR plastic (PE and PP)[31].

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.

Background to requirement O19 Additives – prohibited substances

This is a new requirement in generation 7. The requirement covers ingoing substances in additives that are added to the polymer raw material in the master batch or compound. Substances that arise from the actual polymer production are thus not covered by this requirement. Recycled plastic raw materials are counted as polymer raw materials, where additives that are added to a new master batch or compound are covered by requirements.

The list is based on the general principles from Nordic Swan Ecolabelling regarding undesirable compounds in combination with corresponding requirements for other Nordic Swan Ecolabelled product. For more information see chapter 3.6 chemical.

Background to requirement O20 Manufacturer of EPS, XPS, PIR, and Polyurethane (PU)

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

This is a new requirement in generation 7.

Polyurethane must not be foamed using CFC, HCFC, HFC or methylene chloride. These substances are stable organic substances that are strong greenhouse gases. CFC and HFC break down the ozone layer and methylene chloride are suspected of being carcinogenic. Manufacturers have phased out the use of these agents as foaming agents, but it is still considered relevant to keep the requirement to ensure that they are not used.

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 foam that has completely hardened is harmless, but it is important to limit worker's exposure to it because of the risks of unreacted isocyanates. Production of polyurethane foam does not take place in a closed process and personal protective equipment (respiratory masks and gloves) are only required for certain stages of the process. Closed-loop systems have therefore been removed from the requirement. Instead, a description of the safety measures taken to minimise employee exposure 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[32].

4.6.6 Material based on recycled composite

The requirement in this chapter comprise panels made of recycled composite material. The panels must not comply with the other requirements for raw material, e.g., wood raw materials in section 4.6.1 or plastic in section 4.6.5.

Background to requirement O21 Recycled composite

New requirement in generation 7. The requirement has been changed after the consultation 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. Recycled composite is also not a very common material to use in panels or mouldings for interior use today.

New types of panels based on material that is already a composite is getting introduced on the market. One example is the company Swedish company which

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

manufacturers panels from composite packaging. 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 material as e.g., composite packaging can be a difficult material to recycle since it consists of different materials. The material is normally sent to incineration. By manufacturing a panel from the material, it gets a new area of use and is being used in a product with long technical lifetime.

Background to requirement O22 Chemicals in recycled composite

This is a new requirement in generation 7. 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.

Background to requirement O23 Additives – prohibited substances

This is a new requirement in generation 7. If any chemical additives are used during the manufacturing of material based on recycled composite, they must not contain the listed substances. For more information see chapter 3.7 chemicals.

4.6.7 Mineral raw materials

The requirement in this chapter covers sourcing of virgin mineral raw materials and content of heavy metals in the mineral raw materials. The requirements apply to virgin minerals such as gypsum, limestone, volcanic rocks, and silica used in panels such as gypsum plasterboards, cement-based panels and acoustic panels containing mineral wool.

Background to requirement O24 Responsible sourcing of virgin mineral raw materials

This is a new requirement in generation 7 of the criteria. The latest assessment of the State of Nature in the EU, published in 2022, shows that we are unfortunately still losing nature as too many protected species continue to decline. The new European Biodiversity Strategy provides Biodiversity provides a real opportunity to put Europe´s biodiversity on a pact to recovery by 2030[33].

The extraction of minerals, particularly by surface methods, inevitably results in changes to the characteristics of the land and local biodiversity where it takes

[33] EU Biodiversity Strategy for 2030; https://environment.ec.europa.eu/strategy/biodiversity-strategy-2030_en, visited March 2023

place[34]. Many source eco-systems harbour endemic species and highly diverse communities that are crucial for ecosystem functioning and services supply, including food and clean water provision, and land stability. Mining poses serious, often irreversible, and far-reaching impacts, to those ecosystems, for example through erosion, shrinking deltas, salinization, pollution, and traffic disturbances. However, these changes are often temporary, and if carefully managed, is possible to protect species/biotope both during active operations and after end use-phase[35].

The licensee must have a supply chain policy/code of conduct for responsible sourcing of mineral raw materials The policy must concern biodiversity and deforestation risk - reducing impact to biodiversity along the whole supply chain. Addressing biodiversity risk involves e.g., knowing your supply chain, engaging suppliers, implementing strong purchasing standards, and monitoring mechanisms and being transparent. The policy must be both public and communicated to the supply chain.

Virgin mineral raw materials used in panels must come from mining operations (quarries) with documented biodiversity management and rehabilitation plans. This means that the licensee must have full traceability to the specific mining operations (quarries) where the minerals are extracted from. The European mineral mining industry such as Cembureau[36], Eurogypsum[37] and UEPG[38] have been working with biodiversity for several years and have been developing guidelines for biodiversity management and rehabilitation plans for mining operation (quarries).

Background to requirement O25 Heavy metals

The requirement covers both primary mineral raw materials and mineral bi-products such as fly ash from heat and power generation at coal-fired power and district heating stations. Different raw materials may contain higher quantities of heavy metals compared to the background levels, e.g., in soil. These include natural gypsum, gypsum from cleaning of smoke gas (industrial gypsum), fibreglass from collected glass and mineral wool from stone. It is important that the heavy metal content is not too high that it creates problems in the user phase or for reuse of product materials. The requirement for lead, cadmium and mercury has been adjusted slightly i in generation 7.

4.6.8 Gypsum

Background to requirement O26 Recycled gypsum plasterboard

This requirement has been adjusted compared to generation 6.

Gypsum is 100% recyclable. Waste collection and recycling systems are operational in several European countries. However, a large proportion of

[34] Torres A et al: Unearthing the global impact of mining construction minerals on biodiversity, 2022
[35] https://ec.europa.eu/environment/nature/natura2000/management/docs/NEEI%20case%20studies%20-%20Final%20booklet.pdf, visited March 2023.
[36] The European Cement Association
[37] European Gypsum Industry
[38] The European Aggregates Association

gypsum waste is still landfilled or backfilled[39]. In 2019, around 600.000 tonnes of recycled gypsum from construction and demolition waste were used in plasterboard production process in Europe: with no significant progress from 2018. The recycling volumes remains low compared to the potential. There are important discrepancies across European countries, with Nordic countries performing better on recycling rates.

Nordic Ecolabelling wants to support and effect the gypsum circularity. Data[40],[41], [42] and dialog with European manufactures of gypsum panels shows that the average content of recycled gypsum from demolition/building construction waste is around 30% (25% DSG/FD gypsum and 5% recycled internal/external gypsum) in 2022. A requirement for minimum 30% recycled gypsum in gypsum panels of which at least a third (10%) is recycled internal/external gypsum (not DSG/FDG gypsum) supports the gypsum industry in a more sustainable and circular production.

Flue gas desulfurization gypsum (FGD) is an industrial by-product generated in coal-fired power plants. As coal-fired power plants are to be phased out and replaced by environmental more friendly alternatives in Europe, the amount of FDG gypsum decreases. Nordic Ecolabelling supports the used of FGD gypsum (a waste product), but the potential lies in increasing the share of recycled gypsum from external construction and demolition waste. Therefore, FGD- and DSG gypsum is not part of the requirement for minimum 10% recycled internal and external gypsum in plasterboards.

4.6.9 Mineral wool

The requirements in this chapter comprise mineral wool (stone- and glass wool).

Background to requirement O27 Recycled mineral wool

The requirement has been strengthened compared to generation 6.

In OECD countries, the built environment is responsible for around 30% of raw materials use and up to 40% of solid waste generation[43],[44]. In Europe, 57% of the insulation market is dominated by mineral wool[45] which is the general term for stone wool and glass wool. Mineral wool waste is generated both from mineral wool production and construction activities. The waste got from production stage is easier to recycle in the production company, while the latter is often not recycled due to the unknown composition and is instead landfilled or incinerated as mixed construction waste[46]. However, with the high contents of Si in X-ray amorphous mineralogy, both stone wool and glass wool have the potential to be

[39] www.eurogypsum.org (visited February 2023)
[40] www,eurogypsum.org (visited October 2023)
[41] https://www.epddanmark.dk/media/gvgnxzo3/md-22138-en.pdf (visited February 2023)
[42] https://norgips.no/produkter/gipsplater/standard-eco (visited February 2023)
[43] https://www.oecd.org/environment/waste/OECD-G20-Towards-a-more-Resource-Efficient-and-Circular-Economy.pdf
[44] https://environment.ec.europa.eu/topics/waste-and-recycling/construction-and-demolition-waste_en (visited March 2023)
[45] Sohn, J.L., Kalbar, P.P., Banta, G.T. and Birkved, M., 2017. Life-cycle based dynamic assessment of mineral wool insulation in a Danish residential building application. Journal of cleaner production, 142, pp.3243-3253.
[46] Müller, A., Leydolph, B. and Stanelle, K., 2009. Recycling mineral wool waste: technologies for the conversion of the fiber structure, Part 1. Interceram, 58(6), pp.378-381.

the precursors of alkali-activated materials (AAMs). Mineral wools also have very consistent chemical and physical compositions, which make them even more attractive as raw materials for alkali activation.

Reusing mineral wool waste, which is not normally recyclable, decreases landfilling and increases the recycling rate of construction waste. Also, the consumption of primary resources is minimized by using mineral wool waste to produce new commercial mineral wood.

The potential for recycling glass wool is higher compared to stone wool as glass wool can be made from both natural and recycled glass. Therefore, the requirement for minimum share of recycled material is higher for glass wool than stone wool[47].

The minimum requirements for minimum share of recycled materials are based on dialog with several stakeholders and EPDs.

Background requirement O28 Additived – prohibited substances

This is a new requirement in generation 7. Mineral wools may contain oils and other lubricants, added during processing to reduce dust generation from the product. An organic binder may be applied to the wools after primary fiberizing to hold the fibres together. The binder is often a phenol-formaldehyde resin in aqueous solution, but in the recent years, alternatives such as acrylic resins have been used. Nordic Ecolabelling therefore propose to ban CMR classified additives which means that phenol-formaldehyde resin can't be used.

For more information see chapter 4.7 chemicals.

4.6.10 Metal - aluminium

The requirement in this chapter applies to aluminium such as aluminium used as frames in acoustic panels.

Background to requirement O29 Production of aluminium

This is a new requirement in generation 7. Metal is normally not used in panels for interior use, but aluminium can be included in frames in certain types of acoustic panels. Nordic Ecolabelling has not seen examples of the use of other metals such as steel, and the requirement therefore only covers aluminium.

Using recycled metal significantly reduces the environmental impact and provides a significant climate benefit. Among other things, this is highlighted in the taxonomy work in the EU[48]. Nordic Ecolabelling is aware that the availability of recycled aluminium and traceability can be a challenge. But in a world with an increasing focus on circular economy, Nordic Ecolabelling believes that there will be an increased focus on this in the future. Traceability in the production chain is also a value, and is important for several aspects, e.g., it provides opportunities to select suppliers based on e.g., environmental work, working conditions and quality. Demand for traceability will hopefully contribute to the industry also placing increased focus on this. For Aluminium, Hydro has launched its own

[47] https://www.eurima.org/how-is-mineral-wool-insulation-made, visited April 2023
[48] Taxonomy report, technical annex, EU technical expert group on sustainable finance, March 2020

traceability certification with a minimum of 75% recycled Al, Hydro Circal[49]. The industry average for EU-produced aluminium is approx. 50% recycled, while for Al outside the EU it is approx. 40%. The big environmental benefit comes from the use of post-consumer recycled aluminium.

The requirement model is based on a mandatory requirement to the aluminium producer to have an energy and greenhouse gas calculation with defined reduction targets. Certification with ASI is something that Nordic Ecolabelling see as positive initiatives for a more sustainable metal production. This is an independent certification system with a focus on both economic, social, and environmental aspects. For aluminium, the requirement can also be fulfilled by documenting direct emissions of greenhouse gases and energy efficiency in the electrolysis process, where the limits are based on values stated in the EU taxonomy report. Direct emissions are to be calculated according to the methodology used for EU-ETS benchmarks. Please note that these values may change based on the outcome of the EU taxonomy work.

4.7 Chemicals

The requirements in this chapter apply to chemical products, used in the production of the Nordic Swan Ecolabelled product, such as adhesives, resins, and waxes, as well as to surface treatments. The chapter is divided into 2 sub-sections:

- Requirements concerning chemicals in the production of the Nordic Swan Ecolabelled product, such as adhesives, resins and waxes, Section 4.7.1
- Requirements concerning chemical products used for surface treatment*, Section 4.7.2

* *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 in Sections 3.7.1.*

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

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 exempt from the requirements. Ingoing substances and impurities are defined as below, unless stated otherwise.

- **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.

[49] https://www.hydro.com/en/products-and-services/low-carbon-aluminium/hydro-circal-75r/ (available 2022-10-17)

- **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.

4.7.1 Chemicals used in the production of panels

The requirements in this chapter concern chemicals used in the production of the Nordic Swan Ecolabelled product itself such as adhesives, resins, or additives.

Background to requirement O30 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.

The requirement has been amended to also include the classifications Toxic to the environment (H400, H410, H411 and H420). The previous generation of the criteria contained a requirement limiting the amount of environmentally hazardous ingoing substances in the chemical products used in the production of the Nordic Swan Ecolabelled product. This requirement has been replaced by a complete ban on the presence of chemical products in any of the environmentally hazardous classifications listed in the requirement.

Exemptions:

An exemption is made for adhesive products containing methylene diphenyl diisocyanate (MDI). There are currently no substitute products that are widely available in the market.

The exemption for adhesives containing formaldehyde is only granted if later requirements 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 harmonised 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 harmonised classification, but there may still be producers who use this self-classification alongside the harmonised 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.

An exemption has also been introduced for UV curing products that can be used to impregnate the top paper layer. The UV curing technique is used to achieve a surface with good durability and quality, while at the same time having the advantage that the chemicals have low VOC levels.

Background to requirement O31 Classification of ingoing substances

A ban on CMR Category 2 substances has also 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.

Exemptions are also needed in this requirement for methylene diphenyl diisocyanate (MDI), formaldehyde, phenol, and melamine. See more background about this in the previous requirement.

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. 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 coated with TMP.

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.

Background to requirement O32 Prohibited substances

The requirement is essentially the same as in generation 6 of the criteria, but is tightened in certain respects, e.g., bisphenols are generally banned (and not just Bisphenol A). In addition, the requirement concerning endocrine disruptors has changed.

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 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.

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[50]. 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".

[50] 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).

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 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.

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.

Per- and polyfluoroalkylsubstances (PFAs), e.g., PFOA and PFOS

Fluorosurfactants and other per- and polyfluoroalkyl substances (PFASs) constitute a group of substances that have harmful properties. Certain per- and polyfluorinated compounds can degrade to the very stable PFOS (perfluorooctane sulphonate) and PFOA (perfluorooctanoic acid) and similar substances. These substances are extremely persistent and are easily absorbed by the body10. The substances are found all over the globe, from the large oceans to the Arctic. PFOS have also been found in birds and fish and in their eggs. The substances in this group impact on the biological processes of the body and are suspected to be endocrine disruptors, carcinogenic and to have a negative impact on the human immune system11. PFOA, APFO (ammonium pentadecene fluoro octanoate) and certain fluoride acids are on the Candidate List due to their reprotoxicity, as well as PBT. There are new research results showing that shorter chains (2-6 carbon atoms) have been discovered in nature[51].

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.

[51] Perkola, Noora, Fate of artificial sweeteners and perfluoroalkyl acids in aquatic environment, Doctoral dissertation Department of Environmental Sciences, Faculty of Biological and Environmental Sciences, University of Helsinki, Finland 12.12.2014, https://helda.helsinki.fi/bitstream/handle/10138/136494/fateofar.pdf?sequence=1

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.

Bisphenols

Bisphenol A is used as a monomer in epoxies, paints, varnishes, and adhesives. While there was previously a ban on Bisphenol A (BPA), CAS no. 80-05-7), the ban now applies to bisphenols in general. The reason why the ban now covers all bisphenols is that other bisphenols, such as Bisphenol F and S, can be used as a replacement for BPA. In the screening programme for environmental toxins in water, sediment and biota in Norway, Bisphenol A, F and S have been found[52]. These are substances that have the same properties as Bisphenol A[53]. Bisphenol A can be released into the environment from the production process. BPA is identified as damaging to the eyes, irritating to the respiratory tract, skin sensitizing and may also affect reproductive performance. The substance may be endocrine disrupting and is toxic to aquatic organisms. Bisphenol A is used, for example, with Epichlorhydrin to produce Bisphenol-A-(epichlorhydrin) epoxy resin (CAS no. 25068-38-6), which is classified as allergenic and environmentally hazardous. The ban seeks to exclude the use of epoxy resins where BPA is included.

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.

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.

Pigments and 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,

[52] Screening programme 2013: New bisphenols, organic peroxides, fluorinated siloxanes, organic UV filters and selected PBT substances, Norwegian Environment Agency, Report M-176/2014
[53] https://tema.miljodirektoratet.no/no/Tema/Kjemikalier/Miljogifter/Bisfenol-A/

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 O33 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 O34 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 harmful effects on health and the environment[54],[55],[56],[57],[58],[59]. 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)[60].

Most nanomaterials on the market today have either been in use for decades or have recently been manipulated into nanoforms of existing materials[61]. For example, carbon black nanoparticles and amorphous silicon dioxide (SiO2) have

[54] 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

[55] 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

[56] 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.

56 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

[57] 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

[58] 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

[59] 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

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

[61] 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

been used in previous centuries. Titanium dioxide (TiO2) has long been used as a dye in bulk form but is now manufactured as a nanomaterial for other purposes[62]. Other types of engineered nanomaterials are expected to enter the market in the future[63].

In the construction panel product group, nanomaterials are used, among other things, to impregnate or seal surfaces, 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. 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, nano size pigments are exempted. Although clear conclusions on the safety of nano pigments cannot be drawn[64], 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[65],[66]. 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 nano size, include carbon black, and iron oxides[67]. Carbon black used in paints is very finely ground and has a particle size of approximately 10–30 nm[68]. Iron oxide pigments can include only nano size particles, or only a fraction of the particles may be nano. Inorganic nano pigments are also added to products for several 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, if these fillers are only physically processed (ground, sieved and so on) and not chemically modified. An exemption for inorganic fillers has been added if they are covered by Annex V, point 7 of REACH.

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[62] 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

[63] 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

[64] 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.

[65] 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

[66] 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

[67] Industrial Organic Pigments; W. Herbst, K. Hunger; Third edition 2004; pp. 120–124

[68] Coatings Handbook; Thomas Brock, Michael Groteklaes, Peter Mischke; 2000; p. 128

Synthetic amorphous silicon dioxide

Synthetic amorphous silica (SAS) is a manufactured silica (SiO2) that has been used in industrial, consumer and pharmaceutical products for decades[69]. Silica plays an important role in coating formulations; this is true for non-surface treated types as well as surface modified types. SAS is a nanomaterial under the European Commission definition and is exempted from the requirement due to a lack of alternative substance.

Background to requirement O35 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. The exemption is the same as in generation 6 for bronopol, isothiazolinones and CMIT/MIT, while IPBC is new to the list. 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 O36 Volatile organic compounds in adhesives

The requirement remains unchanged. Volatile organic compounds (VOC) 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 adhesives. 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 O37 Free formaldehyde

The limit values for free formaldehyde have been made stricter compared with the previous criteria, generation 6. For chemical products other than adhesives, the limit value has been tightened from 0.2% to 0.02% by weight. The exemption for adhesive mixed with hardener has also been removed to harmonise with the criteria for Furniture and fitments, generation 5. The adhesive must contain no more than 0.2% free formaldehyde by weight, with the requirement applying to

[69] https://www.asasp.eu/images/Publications/Nano_-_SAS_factsheet_-_201209.pdf

the pure adhesive. After consultation an exemption for adhesive products used for load-bearing structures have been introduced, the pure adhesives in these systems typically contain a higher amount of free formaldehyde than 0.2 %. For these adhesives the requirement can be applied to the mixture of adhesive and hardener, if the mixture and application is performed in a way that protects the workers from exposure. It is important that these adhesive systems provide sufficient strength for the load-bearing structure. The finished product must also meet the requirement for formaldehyde emission.

Formaldehyde is a toxic and allergenic substance (H317) that has carcinogenic effects (H351) and should therefore be avoided as far as possible. 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 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 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 can control or influence the choice of wood/material to which the adhesive is applied.

Some in the industry have been asking why Nordic Ecolabelling has a requirement for maximum content of free formaldehyde in adhesives, when there are later requirements for emission of formaldehyde. Nordic Ecolabelling wishes to retain the requirement, as low levels are generally a good thing, and it can also be important regarding the working environment. In our experience, the requirement has also provided positive environmental and health benefits since there are adhesives on the market that do not meet this.

4.7.2 Surface treatment

The requirements in this chapter apply to surface treatment* products such as lacquers, oils, paints, and stains. There are also requirements for foiling with plastic. Any filler used is also covered by these requirements.

** 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 in Sections 4.7.1.*

Background to requirement O38 Plastic foiling

Panels can be foiled with a thin layer of plastic. This provides a durable surface and can thus extend the life of the product. It can also reduce the use of chemicals for surface treatment. Previously, no requirements were set for such plastic foiling, and the requirement is new for this generation. A ban on PVC is a

requirement that Nordic Ecolabelling includes in many criteria. The environmental impact of PVC is associated primarily with waste management, the use of additives and dioxin emissions, for example in the manufacture and incineration of PVC. The latest membrane cell technology is considered to be the most environmentally-sound means of production, but the membranes are coated with PFAS and this represents a potential source of PFAS contamination to the environment. The mercury method is still used to produce chlorine at some plants[70].[71].

Background to requirement O39 Classification of chemical products

The requirement has been amended to also include the classifications Toxic to the environment (H400, H410, H411 and H420), H334 and H362. The previous generation of the criteria contained a requirement limiting the amount of environmentally hazardous ingoing substances in the chemical products used in the surface treatment of the Nordic Swan Ecolabelled product. This requirement has been replaced by a complete ban on the presence of chemical products in any of the environmentally hazardous classifications listed in the requirement. Classification H334 (Allergenic, Respiratory sensitisation) has been added for work environment reasons and to harmonise with the Nordic Ecolabelling criteria for Furniture and fitments. H362 is a classification that did not exist when the criteria were previously revised. 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.

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 number 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.

Background to requirement O40 UV curing surface treatment system

The requirement above limiting the use of chemical products classified as environmentally hazardous contains an exemption for UV curing products. These kinds of products are often classified as environmentally hazardous due to the content of acrylates. The acrylates change properties in the hardening and bind

[70] Chlorine and Building Materials: A Global Inventory of Production Technologies, Markets, and Pollution, Phase 1: Africa, The Americas, and Europe, Healthy Building Network, 2018
[71] Chlorine and Building Materials: A Global Inventory of Production Technologies, Markets, and Pollution, Phase 2: Asia, Healthy Building Network, 2019

to the surface coating, so they do not pose an environmental hazard in the finished product. Instead, it is important that no emissions of uncured product that have the environmentally hazardous properties occur. Requirements are therefore set for the application, which must take place in a controlled closed process where no discharges to recipient take place.

Background to requirement O41 Classification of ingoing substances

The requirement has been tightened to now include Category 2 substances. An exemption applies for photo initiators. They may be present in UV products. They are present in small amounts but are necessary to speed up the hardening process.

An exemption has also been introduced for the hardener in two-component UV products if it can be documented that workers are not exposed, and application takes place in closed systems. After curing, the hardener no longer has these properties. 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 consumer will not be exposed to these substances.

Exemptions have also been added for titanium dioxide (CAS no. 13463-67-7), 1.1,1-Trimethylolpropane (TMP, CAS no. 77-99-6) and mequinol (CAS no. 150-76-5). 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 coated with TMP. Trimethylolprepane triacrylate (TMPTA) (CAS 15625-89-5) have been reclassified as class 2 carcinogen H351. Mequinol is used as a diluent in binders for UV surface treatments.

All 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. However, the exemption for TMP is time-limited since the industry is working to substitute the substance.

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.

Background to O42 Prohibited substances

The requirement is largely the same as in Section 3.6 except for VAH. In addition, there are now specific exemptions that are relevant for surface treatment products.

Volatile aromatic hydrocarbons (VAH)

The previous generation of the criteria limited the amount of VAH only in adhesive products. The limit has now been changed to also cover chemical products for surface treatment. This is the case in other Nordic Ecolabelling criteria, e.g., Furniture and fitments. Volatile aromatic hydrocarbons (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.

Paint pigments:

Halogenated paint pigments are used in the paint industry and an exemption is made if they meet the EU's requirements concerning colourant pigments in food packaging under Resolution AP (89) item 2.5. PCBs have been found in analyses of paints containing organic pigments. PCBs are not added but can be formed in the production process by reactions between different chlorinated solvents and the organic pigment. Nordic Ecolabelling does not really want to allow PCBs, but since it is not possible to set a zero limit for the pigments, Nordic Ecolabelling has chosen the same level that is approved in food packaging (Resolution 89 point 2.5). This threshold has been set because it is an established method in the industry and the low threshold allowed in food packaging is considered strict enough for indoor surface treatment products. The exemption for these pigments is necessary to enable the manufacturers to make products with good colour fastness and not use pigments that are even more damaging to the environment.

Epoxy acrylate in UV curing surface treatment products

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 surface finishing 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 surface treatment 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.

BHT in UV curing lacquers and paints

BHT is included in the EU member state initiative "Endocrine Disruptor Lists", List II Substances under evaluation for endocrine disruption under EU legislation. BHT has an important function in UV curing lacquers and paints and is difficult to replace, therefore an exemption has been introduced with a maximum limit in the chemical product. Nordic Ecolabelling does not want to prohibit the use of UV curing lacquers and paints, as they have other positive properties. If BHT receives an official harmonised classification that is not permitted in these criteria, the exemption is no longer valid.

Exemption for aziridine/polyaziridines

Aziridines and polyaziridines are on the list of prohibited substances as they are often classified as CMR. Polyaziridines are used as crosslinks in surface treatment systems. Product developments are constantly being made in the field of surface treatment, including the development of new types of aziridines as crosslinks. If it can be documented that the aziridine compound used is not classified as carcinogenic, mutagenic or reprotoxic by any manufacturer or ECHA, it is exempted from the requirement.

Background to requirement O43 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 O44 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 harmful effects on health and the environment[72],[73],[74],[75],[76],[77]. 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)[78].

[72] 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

[73] 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

[74] 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.

74 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

[75] 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

[76] 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

[77] 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

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

Most nanomaterials on the market today have either been in use for decades or have recently been manipulated into nanoforms of existing materials[79]. For example, carbon black nanoparticles and amorphous silicon dioxide (SiO2) have been used in previous centuries. Titanium dioxide (TiO2) has long been used as a dye in bulk form but is now manufactured as a nanomaterial for other purposes[80]. Other types of engineered nanomaterials are expected to enter the market in the future[81].

In the construction panel product group, nanomaterials are used, among other things, to impregnate or seal surfaces, 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. Exemptions, see background under O34.

Background to requirement O45 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. The exemption is the same as in generation 6 for bronopol, isothiazolinones and CMIT/MIT, while IPBC is new to the list. 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 O46 Free formaldehyde

For further background information about free formaldehyde, see Section 4.7.1.

Background to requirement O47 Application method and quantity – surface treatment

[79] 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

[80] 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

[81] 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 is new since the previous generation of the criteria did not consider the efficiency of the application method. This change has been made to harmonise with other Nordic Ecolabelling criteria, e.g., Furniture and fitments and Floor coverings. 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 O48 Quantity of applied volatile organic compounds (VOC)

The reason for this requirement is that VOCs contribute to the formation of ozone and can have adverse health effects in the workplace and indoor climates.

The limit values remain unchanged in the requirement since they are still considered to be strict. One change that has been made is inclusion of the efficiency rate of the application method. This is described in more detail in the background to the previous requirement.

4.8 Emissions

The requirements in this chapter cover different types of emissions. Emissions from the product (4.8.1), from the production process (COD 4.8.2) and in the working environment (4.8.3) are subject to requirements.

4.8.1 Emissions from the product

Background to requirement O49 Emissions of formaldehyde and VOC

The requirement has been tightened from respectively 0,09 mg/m^3 (MDF) and 0,07 mg/m^3 (other wood-based panels) to respectively 0,06 mg/m^3 (according to EN 717-1) or 0,096 (according to EN 16516) for all types of wood-based panels. A limit of 0.06 mg of formaldehyde per m^3 (according to EN 717-1) makes sure that the requirement fulfils the EU taxonomy requirements. For laminate and other types of panels/moulding the requirement is on the same level as in generation 6. New requirement for carcinogenic VOC cat. 1A and 1B has been introduced for all types of panels to fulfil the EU taxonomy requirements[82].

This requirement is relevant since building materials have a major impact on the indoor environment of a building, and it is important to ensure that Nordic Swan Ecolabelled panels contribute to a good indoor environment. Formaldehyde is a toxic, sensitising, and carcinogenic substance and Nordic Ecolabelling wants to restrict its use to the greatest extent possible from an occupational health and safety point of view and to reduce emissions in the use phase. Adhesive systems containing formaldehyde are often used in the manufacture of panels.

The requirement for formaldehyde emissions from panels 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[83], EN 717-1 is the method that

[82] Chttps://ec.europa.eu/sustainable-finance-taxonomy/activities/activity/350/view
[83] Comparison of formaldehyde concentrations in emission test chambers using EN 717-1 and EN 16516 (CEN/TC 351/WG 2), 2020-07-22

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 88) the conversion factor for using EN 16516 is 1,6, which is the basis for the limit of 0,096 mg/m^3. 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)[84] 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.

For laminate and other types of products, e.g., gypsum and cement-based panels, the limit value is set to 0.03 mg/m^3 according to EN 16516. This limit value is the same in generation 6 of the criteria and stricter than the limit values in the EU taxonomy as well as EU legislation. The experience of Nordic Ecolabelling is that the value is strict but possible to fulfil without deteriorating the quality of the product.

Requirements for TVOC and TSVOC must also be fulfilled for laminate and other types of products. These limit values are also the same as in generation 6 of the criteria and still considered to be strict. Wood-based products (including melamine faced products) must not meet the VOC requirements. Wood-based products with surface treatment was covered by the VOC requirements in generation 6. It is considered sufficient that this type of products fulfils the requirements for formaldehyde emission and applied VOC in surface treatment systems.

4.8.2 Emissions from the production – COD

Background to requirement O50 Emissions of COD from wet processes

The energy requirement is unchanged compared to generation 6 of the criteria.

Panel production using a wet process produce emissions to water of oxygen-demanding organic matter (COD). Microorganisms consume oxygen to break down the organic matter. This may lead to low oxygen concentrations in the water and, in some cases, anaerobic conditions. A benefit of panels produced using a wet process is that they usually do not contain any adhesive – the lignin already in the wood is enough to hold the material together. Nordic Ecolabelling therefore wishes to allow panel production with a wet process, but it is important to ensure low levels of COD emissions.

4.8.3 Emissions from the production – working environment

Background to requirement O51 Emissions to air from production of laminate in HPL and compact 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,

[84] https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32023R1464, visited November 2023

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. This generation of the criteria has a tighter requirement than before concerning emissions of formaldehyde, during both an 8-hour period and a reference period of 15 minutes. The new, stricter 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). The limit values for phenol in the previous generation of the criteria already matched the levels identified in the examined legislation, and they have therefore not been tightened.

Background to requirement O52 Emissions of dust

The requirement remains unchanged. The requirement seeks to ensure that working conditions in relation to dust emissions are acceptable, regardless of where the panel is produced.

Production in countries where the official mandatory emission requirements are at the same or a stricter level than this requirement is exempted from the requirement. No limit values have been defined for the indicated emission types in the EU Commission directives (Commission Directive 2000/39/EC, Commission Directive 2006/15/EC, Commission Directive 2009/161/EU) of relevance to the area. On the other hand, all working environment authorities in the Nordic countries have defined limit values for mineral dust, wood dust and organic dust generally, which are relevant for panel production systems in the product group.

4.9 Climate and energy

This chapter contains requirements for the energy consumption in the production of the different types of panels and specific type of raw materials used in the panels.

The energy consumption is calculated as MJ/kg product produced, and encompasses all energy used from **gate to gate** (phase A3 in EPDs) at the panel production site. Energy consumption also needs to be calculated for specific type of raw materials such as pulp/paper, resin/glue, laminate, cement, and mineral wool used in panels.

The requirements must be documented in the form of energy consumed (actual energy used in production) without the use of primary energy factors.

The requirement may be documented either just for the specific production of the ecolabelled panel or for the company's total annual production.

System boundary for the requirement: Energy consumption for extraction of raw materials and transports of raw materials is not part of the energy requirement. The energy requirements do not apply to raw materials that are included by less than **5 wt%** of the panel.

Further descriptions of how the energy calculation should be carried out can be found in Appendices 6.

4.9.1 Panels made from renewable raw materials

The requirements apply to energy consumption in the production of; kraft paper and paper pulp used in HPL, compact laminate, wood-based panels, panels made from other lignocellulose raw materials, CLT, glulam and solid wood panels/mouldings.

Background to requirement O53 Energy consumption in the production of kraft paper and pulp that is included in HPL, compact laminate, acoustic- or gypsum plasterboards

Background to requirement O54 Energy consumption – laminate production

Background to requirement O55 Energy consumption – wood-based panels

Background to requirement O56 Energy consumption – panels made from other lignocellulose raw materials

Background to requirement O57 Energy consumption – CLT and glulam (cross and glued laminated timber)

Background to requirement O58 Energy consumption – Solid wood panels and mouldings

The requirements have been tightened in generation 7.

The most environmentally friendly energy is the energy that is not used. Energy-efficient production is generally important in reducing the environmental impact from the use and production of energy. In a complex world where lack of energy might become more prominent in the future, it is important that everyone tries to reduce their own consumption. Energy consumption also directly affects greenhouse gas emissions. Energy-efficient production and lower energy consumption will thus also reduce greenhouse gas emissions. Nordic Ecolabelling is therefore committed to setting requirements concerning maximum use of energy wherever possible. The RPS analysis shows that there is generally high environmental relevance in setting requirements for energy consumption, for both ingoing materials and the panel production itself. Several of the production lines use processes that involve a great deal of heat or pressure. Differentiated energy requirements have been set, as the production processes differ, which thus also results in differences in energy consumption. It will also make it possible to separate out the production lines that perform well on energy within each product type.

For panels based on renewable raw materials, a high proportion of renewable fuels is often used. This may be from waste wood that is not of sufficient quality to be included in the panels. But there are also manufacturers that use electricity or fossil raw materials in the form of gas or oil.

In panels where paper makes up a high proportion of the material composition, the paper contributes a significant part of the panel's total energy load. There are therefore energy requirements for pulp and paper production for the paper types included in the panel, in addition to energy requirements for the actual panel production. The manufacturer of the pulp and paper must document the energy consumption. The requirement does not cover decor paper, as it is a little further back along the supply chain, making documentation more difficult to obtain. In addition, it constitutes a relatively small proportion of the product's ingoing paper. An HPL panel may contain around 50–60% kraft paper and 2–15% decorative paper. Energy requirements and calculation methods for pulp and

paper are taken from Nordic Ecolabelling's Basic Module for paper. The Basic Module does not contain specific requirements for the type of paper used in laminate, kraft paper, and the reference value to produce this paper type has therefore been specifically developed for and adapted to this product group.

Energy requirements for solid wood products such as panels and mouldings are new to this generation. Here, energy consumption is mainly related to the drying and processing of wood, such as sawing and planning, with the drying process as the process with the highest consumption. Nordic Ecolabelling has had limited information on which to base the requirements. Investigations have focused on literature, EPDs and contact with the industry. There are some EPDs, but it is difficult to compare the information available there and use it to find a relevant requirement level. Information from studies shows that sawmill energy consumption is about 1500 MJ/m3[85],[86],[87]. It appears that there is great variation between different companies. A specific reason for this has not been identified, but the type of drying process used is most likely a key factor for energy efficiency. In a batch kiln, batches of sawn timber are placed inside, the doors are closed, and the heating begins, with moisture also added to the air. Gradually during the process, the air humidity is changed to create a drier climate. In a progressive kiln, sawn timber is conveyed continuously through different climate zones. The climate is kept constant in each zone, with the wood moving through the different zones over the course of the drying time. Since the progressive kilns have a constant climate, they are ideal for the installation of heat exchangers, and will thus consume less energy. Because this is a continuous process, it also avoids the energy hungry warm-up period that is required in a batch kiln.

For products consisting of solid wood and adhesive, such as CLT and glulam, a new energy requirement has also been introduced. The requirement has been set based on dialogue with stakeholders. It was also possible to label CLT in the previous generation of the criteria, but there was no specific requirement for this type of product.

4.9.2 Panels made from mineral- and non-renewable raw materials

The requirements apply to energy consumption in the production of; materials based on recycled composite, gypsum plaster boards, mineral wool, mineral wool-based panels, cement, cement-based panels, and panels made from other materials.

Background to requirement O59 Energy consumption – materials based on recycled composite

Background to requirement O60 Energy consumption – gypsum plasterboards

Background to requirement O61 Energy consumption – mineral wool

Background to requirement O62 Energy consumption – mineral wool-based panel (incl. facing/finishing)

Background to requirement O63 Energy consumption - cement

Background to requirement O64 Energy consumption – cement-based panels

[85] Silje Wærp et al., Livsløpsanalyser av norske treprodukter, MIKADO, Sintef Byggforsk, 2009. Norway.
[86] Jungmeier, G. et al, Allocation in Multi Product Systems – Recommendations for LCA of Wood-based Products
[87] Henning Horn, 2008: ENØK i varme- og tørkeanlegg i trelastindustrien, Rapport 72, 2008, Treteknisk

Background to requirement O65 Energy consumption – panels made from other materials

Material based on recycled composite:

The energy consumption in production of recycled composite panels must not exceed 1 MJ/kg panel. This is a strict energy limit based on dialog with stakeholders.

Gypsum plasterboard:

The requirement has been tightened from 4 MJ/kg to 3 MJ/kg for standard plasterboard (e.g., type A, light weight board according to EN 520) and to 3,5 MJ/kg for premium boards, e.g., impact resistant boards in generation 7. In a life cycle perspective, the energy impact in the materials contribute the same as the actual panel production, if 100% natural gypsum is used. The greater the proportion of recycled gypsum in the panel, the greater relative significance the actual panel production will have from a pure energy point of view.

Gypsum plasterboards with a high content of recycled appear to have the greatest energy relevance to produce plasterboards. Production is not particularly energy-intensive, but many heat-using processes are applied, which thus give a potential for optimising energy efficiency of production. In the actual panel production, approximately 90-95% of the energy applied is heat energy and the remainder is electricity. Fossil-based fuel energy is the main source used, in the form of natural gas and, rarely, biomass.

The proposed energy limit on 3 MJ/kg plasterboard is based on dialog with stakeholders and EPD´s.

Mineral wool:

The requirement has been tightened from 20 MJ/kg to 13 MJ/kg glass wool and 15 MJ/kg stone wool produces panels.

Mineral wool production is a high temperature energy intensive process. Glass wool is produced from borosilicate glass at a temperature around 1400 ºC, while rock wool is produced from melting volcanic rocks at about 1500 ºC. The three most important energy sources for glass production are natural gas, fuel oil and electricity. The manufacturing process shares many similarities but special the fiberizing process for glass wool is more energy demanding than for stone wool. Therefore, two different energy requirements have been set for glass and stone wool. Data from Ecofys[88] shows that the total energy consumption in production of glass- and stone wool varies between 9-20 MJ/kg.

The energy limit is based on consultation responses, dialog with stakeholders and EPD´s.

Nordic Ecolabelling wishes to encourage fossil-free manufacturing, and therefore a ban on the use of fossil oil and coal as main fuels for production of process heat in mineral wool factories is introduced. However, necessary use of fossil oil e.g.,

[88] Ecofys: Methodology for the free allocation of emissions allowances in the EU ETS post 2012 - sector report for the mineral wool industry, November 2009

in planned maintenance stops, emergency maintenance stops and as a reserve or tip fuel (peak load fuel) is allowed. Use of coal is, however, completely prohibited.

Tip fuel is peak load fuel that is only used for short periods, e.g., when it is cold. What is meant with reserve fuel can sometimes be a bit unclear. Reserve fuel can e.g., be defined in mineral wool factories environmental permits issued by the authorities. Therefore, it has not been defined in more detail in the criteria itself, but the use of reserve fuel should be calculated in days.

At this point, it is not possible to exclude all fossil fuels in mineral wool manufacturing and therefore, use of natural gas and liquefied petroleum gas (LPG) is still allowed.

Mineral wool-based panels - acoustic panels:

The requirement has been changed compared to generation 6 where it was integrated in the mineral wood requirement. The requirement covers all the energy used (electricity + heat) at the production site (gate to gate, or phase A3 in EPDs). Mineral wool constitutes by far the largest material part in mineral wool-based acoustic panels (70-80%)[89],[90]. As manufacturing of mineral wool contributes the highest energy impact in the panels' life cycle this is covered by a separate requirement. Other materials used in the process of facing of mineral wool covers fleece/glass fleece, glue, and coating.

The requirement includes energy use (electricity and heat) from gate to gate at the production site e.g., cutting, facing the mineral wool, surface coating and packaging. The proposed energy limit is based on dialog with stakeholders and EPD´s.

Cement:

This is a new requirement in generation 7 of the criteria. Portland cement is a key ingredient in different types of cement-based panels/acoustic panels but also one of the major sources of greenhouse gases globally. The cement industry accounts for 5% of the global carbon dioxide emissions[91]. According to estimates, 900 grams of CO_2 emerge from the manufacturing of 1000 grams of cement, resulting in 3.24 billion tons of CO_2 being generated annually[92]. Therefore, requirements are set out to reduce the energy demand, to limit the anthropogenic emissions of CO_2[93].

The specific limits for the different types of cement and hydraulic binders are derived from the average value of the top 10% of installations based on the data collected in the context of establishing the EU Emissions Trading System (EU ETS) industrial benchmarks for the period of 2021-2026 and calculated in

[89] https://www.ecophon.com/uk/about-ecophon/sustainability-we-can-all-believe-in/download-centre/ (visited March 2023)
[90] https://www.rockfon.dk/siteassets/commerce/dk/tiles/documents/documentation/miljoevaredeklaration-epd/miljoevaredeklaration-epd---loftplader---vaegpaneler.pdf (visited March 2023)
[91] The Cement Sustainability Initiative: https://docs.wbcsd.org/2016/12/GNR.pdf (visited 2022-05-30)
[92] Hendriks, C. A., Worrell, E., De Jager, D., Blok, K., & Riemer, P. (1998, August). Emission reduction of greenhouse gases from the cement industry. In Proceedings of the fourth international conference on greenhouse gas control technologies (pp. 939-944). IEA GHG R&D Programme Interlaken, Austria.
[93] Antunes, M., Santos, R. L., Pereira, J., Rocha, P., Horta, R. B., & Colaço, R. (2021). Alternative Clinker Technologies for Reducing Carbon Emissions in Cement Industry: A Critical Review. Materials, 15(1), 209.

accordance with the methodology for setting the benchmarks set out in Directive 2003/87/EC of the European Parliament and of the Council of 13 October 2003 establishing a scheme for greenhouse gas emission allowance trading within the Community and amending Council Directive 96/61/EC[94].

Use of fossil fuels, see mineral wool above.

Cement-based panels:

The requirement has been changed compared to generation 6 where the energy requirement covered all materials used in the cement-based panel. The main material in cement-based panels is cement. The content of cement in fibre cement flat sheets is around 65-80%[95],[96],[97] and around 50-60%[98],[99] in wood wool panels. To simplify the requirement, the energy requirement now covers the manufacturing of cement and the production of the panels. As the manufacturing of cement contributes the highest energy impact in the panels' life cycle it has an impact on the energy consumption in board production due to variation in share of cement. Fibre cement flat sheets has a higher content of cement and thus a lower content of wood fibres compered to wood wool panels. The energy requirement has therefor been divided into two separate requirements for each type of panel. The energy consumption in production of wood wool boards/panels must not exceed 2 MJ/kg board/panel and 3 MJ/kg wood wool panel.

The energy limit is based on dialog with stakeholders and EPD´s.

Panels made from other materials

This is a new requirement in generation 7 of the criteria and covers panels made from other materials such as textile, plastic, or aluminium. This will typically be acoustic panels made from polyester, PET, canvas, or cotton. The requirement covers the energy used to manufacture the acoustic panel (gate to gate, and not energy to produce raw materials such as fibres e.g., polyester fibres or textile/fabrics. However, the production of felt board (often done in PET/polyester) is part of the requirement and involves the process of crossing of PET fibres to create a web of fibres, hardening with heat/pressure, rolling/calendaring and cutting to size. These types of acoustic panels can consist of different types of materials glued/laminated together to create different types of surface-looks e.g., felt board covered with velour or textile.

The energy limit is based on dialog with stakeholders and EPD´s.

4.10 Circularity

The requirements in this chapter concern resource efficiency that have the function to increase the circularity of panels and mouldings. These requirements deal with instructions, maintenance, and take-back systems.

Background to requirement O66 Information for consumers

[94] https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32021R0447&rid=1
[95] https://www.epddanmark.dk/media/w5ld1aty/md-21010-en.pdf (visited March 2023)
[96] https://forzes.dk/produkter/cementsp%C3%A5nplader (visited March 2023)
[97] www.cewood.com (visited March 2023)
[98] https://www.troldtekt.dk/viden/dokumenteret-baeredygtighed/ (visited March 2023)
[99] https://www.baux.com/sustainability/ (Visited March 2023)

It is important that instructions concerning storage and assembly are accompanied the product and/or is available for download on the manufacturer's website to ensure that the panel is handled and used correctly. Information on which materials is made of is relevant when the product is to be discarded/recycled to make it easier to sort material in to correct fractions. Most types of panels in these criteria are covered by harmonised standards which ensure that the panels live up to industry-approved qualities. This information gives the customer assurance of the product's quality.

Background to requirement O67 Maintenance

Proper maintenance is important for a long product life span. The information can either be supplied with the product or the consumer can be referred to information on the manufactures' webpage.

It is important that instructions concerning assembly and maintenance are included to ensure that the panel is used correctly and to contribute to the service life of the product. To improve the opportunities for correct waste sorting, information about ingoing raw materials must also be included, as well as whether the manufacturer takes back old panels or panels that were not used in the construction process.

Background to requirement O68 Take back system

The requirement is new in generation 7. Product take-back systems are fundamental for Circular Economy (CE) and focus on recovering value by taking back products to be recycled, re-manufactured or refurbished. In theory, the expected value from CE in undeniable. However, in practice product take-back systems are often in small scale but the interest in CE is increasing in the entire panel industry due to several benefits such as stronger customer relationship, lover cost of goods sold due to secondary material supply, alternative supply of critical raw materials and reduces environmental impacts.

Due to the different types of panels covered by this criteria and difference in how well these are intergraded in existing waste systems, the manufacture of panels must offer a take back system for taking back products or be in a process/test/pilot face to establish a system for taking back products. There is no requirement for how the manufacture uses the collected products e.g., remanufactured into new equivalent products. Companies that have an established take-back system where the collected products are remanufactured into new equivalent products have the opportunity to meet the requirement for innovation.

4.11 Innovation

The requirement in this chapter covers various areas where Nordic Ecolabelling sees an opportunity to promote manufacturers that contribute to innovation, e.g., by using bio-based raw materials for adhesive production; to the circular economy or reduced greenhouse gas emissions; and to measures concerning biodiversity. One of the points must be fulfilled, and the manufacturer can decide which measure they wish to fulfil. This offers flexibility. Nordic Ecolabelling would also like to provide signals as to what may become mandatory in the next revision of the criteria.

Background to requirement O69 Innovation in production

This is a new requirement in generation 7. Nordic Ecolabelling sees this requirement as a possibility to promote manufacturers who take innovative action and who contribute in various ways to reducing the overall environmental impact from production, either related to the product itself or to the conditions on the production line.

5 Licence maintenance

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

Background to requirement O70 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 O71 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

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

Comparison of requirements for Construction and façade panels in criteria version 6 and criteria version 7.

Proposed requirement generation 7	Requirement generation 6	Same req.	Changed	New req.	Comment
O1 Description of the product	O1	x			The requirement is unchanged
O2 Quality and properties	O34	x			The requirement is unchanged
O3 Acoustic performance				x	New requirement for testing sound absorption

Raw materials					
O4 Tree species – restrictions	O5		x	x	The requirement has been updated with Nordic Ecolabelling's requirements concerning tree species that are prohibited or restricted.
O5 Traceability and certification	O6		x	x	The manufacturer of the product is required to be CoC certified. Particle boards must consist of min. 50% recycled wood raw materials.
O6 Chemicals – recycled wood raw material				x	New requirement for testing of chemicals in recycled wood raw material.
O7 lignocellulose raw materials				x	Requirement introduced for other renewable raw materials such as straw or hemp.
O8 Ecolabelled paper				x	New requirement for Nordic Swan- and EU ecolabelled paper
O9 Tree species - restrictions			x	x	The requirement has been updated with Nordic Ecolabelling's requirements concerning tree species that are prohibited or restricted. The requirement concerning raw material used in paper production is new.
O10 Paper raw material	O5		x		The requirement has been tightened in that the laminate manufacturer must be CoC certified and the limit for certified raw material is now 70%.
O11 Chemicals used in manufacturing of pulp and paper			x	x	Updated according to generation 3, basic module for pulp and paper
O12 Emissions of COD from the production of pulp and paper – HPL and compact laminate	O9	x			The requirement remains unchanged, but with clarification on how the calculation should be made when several pulps are included.
O13 Ecolabelled textile				x	New requirement for Nordic Swan- and EU Ecolabelled textile
O14 Cotton, other natural seed fibres and wool				x	New requirement for organic, recycled, GOTS or SCI certified fibres or wool
O15 Recycled fibres - synthetic fibres				x	New requirement - must comprise of recycled materials
O16 Recycled fibres - test for harmful substances				x	New requirement for test of recycled fibres according to Oeko-Tex 100 class I-III
O17 Recycled plastic				x	Plastic must consist of recycled materials.

O18 Chemicals in recycled plastics				x	New requirement for flame retardants and heavy metals
O19 Additives - prohibited substances				x	Prohibited additives added to recycled plastics
O20 Manufacture of polyerethane foam				x	Halogenated organic compounds must not be used in blowing agents.
O21 Recycled composite				x	The composite material must consist of 100% by weight of recycled material. 50% by weight must be post-consumer recycled.
O22 Chemicals in recycled composite				x	New requirement for flame retardants and heavy metals
O23 Additives - prohibited substances				x	Prohibited substances in production of recycled composite
O24 Responsible sourcing of virgin mineral raw materials				x	Supply chain policy and code of conduct for responsible sourcing of virgin mineral raw materials.
O25 Heavy metals in mineral raw materials		x			Mineral raw materials must be tested for heavy metals
O26 Recycled gypsum			x		The requirement for share of recycled gypsum has been adjusted
O27 Recycled mineral wool			x		The requirement for share of recycled mineral wool has been tightened
O28 Additives - prohibited substances				x	Prohibited additives added to manufacturing of mineral wool
O29 Production of aluminium				x	High proportion of recycled aluminium or from responsible aluminium production
Chemicals in production					
O30 Classification of chemical products	O19		x		Prohibition of chemicals classified as environmentally hazardous has been added.
O31 Classification of ingoing substances	O20		x		Prohibition against CMR category 2 added.
O32 Prohibited substances	O21		x		The requirement has been updated, e.g. referring the requirement for endocrine disruptors to other lists, and the substances that are prohibited have also been expanded
O33 Antibacterial substances	O22	x			
O34 Nanomaterials	O23	x			
O35 Preservatives	O22		x		Requirement limit for MIT has been tightened
O36 Volatile organic compounds in adhesives	O26	x			

O37 Free formaldehyde	O28		x		The requirement limit for formaldehyde content has been tightened.
Chemicals - surface treatment					
O38 Plastic foiling				x	
O39 Classification of chemical products (surface treatment)	O19		x		A ban on chemicals classified as environmentally hazardous has been added (with an exemption for UV curing products). Prohibition of H334 (allergenic) has been added.
O40 UV curing surface treatment system				x	
O41 Classification of ingoing substances (surface treatment)	O20		x		Prohibition against CMR category 2 has been added.
O42 Prohibited substances (surface treatment)	O21		x		See O32. Some other exemptions are granted.
O43 Antibacterial substances	O22	x			
O43 Nanomaterials	O23	x			
O45 Preservatives	O22		x		Requirement limit for MIT has been tightened
O46 Free formaldehyde (surface treatment)	O28	x			
O47 Application method and amount – surface treatment				x	
O48 Amount of volatile organic compounds (VOC) applied	O27		x		The requirement limit has not been changed, but the calculation now takes the application method into account.
Emissions					
O49 Formaldehyde and VOC emissions	O32 and O33		x		The requirement limits have been tightened to align requirement in the EU taxonomy. New requirement limit for carcinogenic VOC in category 1A and 1B
O50 Emissions of COD from wet processes	O29	x			
O51 Emissions to air from production of HPL and compact laminate	O30	x			
O52 Emissions of dust	O31	x			
Climate and energy					
O53 Pulp and paper	O12		x		The requirement has been updated in accordance with Nordic Ecolabelling's Basic Module for pulp and paper, generation 3. The nominal limit has been removed, and only relates to kraft paper.
O54 Laminate (energy)	O13		x		Requirement limits have been tightened.

O55 Wood-based panels	O14		x		The requirement limits have been tightened
O56 Panels from lignocellulose raw materials				x	New req.
O57 CLT and glulam					New req.
O58 Solid wood panels and mouldings				x	New req.
O59 Wood Plastic Composite				x	New req.
O60 Gypsum plasterboards			x		The requirement limit has been tightened
O61 Mineral wool			x		The requirement has been changed and limits has been tightened
O62 Mineral wood-based panels			x		The requirement has been changed and limits has been tightened
O63 Cement				x	
O64 Cement-based panels			x		The requirement has been changed and limits has been tightened
O65 Panels made from other materials				x	New req.
Circularity					
O66 Information to costumer	O35	x			The previous requirement has been divided into two (O3 and O4).
O67 Maintenance	O35	x			The previous requirement has been divided into two and some new points have been introduced, including information about the manufacturer's take-back arrangement.
O68 Take back system				x	
Innovation					
O69 Innovation requirement				x	
O70-O71 Other requirements		x			The requirements have been updated in accordance with Nordic Ecolabelling's current standard formulation.
Removed requirements in gen. 7					
Dust emissions from refining mineral raw materials	O3				
Radioactive substances in panels	O4				

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.

Acoustic panels, acoustic performance O3

The sound absorption test must be carried out in accordance with the standardised test methods in EN ISO 354 and classification according to EN ISO 11654.

Emissions of formaldehyde and VOC from panels O49

The test shall be carried out in accordance with the test method* EN 717-1 and EN 16516 or test methods whit scientifically proven correlation by independent third party.

* *The methods and limit values are based on the EU commission published regulation amending Annex XVII of the REACH Regulation (EC) No 1907/2006. This requirement will be updated following the development of this regulation.*

Test method for COD emissions (wet process) O49

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 un-sedimented samples in accordance with standard ISO 6060.

Working environment – emissions to air O51 and O52

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 2 Energy requirements for paper and pulp production

Energy calculation guidelines

Use of energy in the form of fuel and electricity is subject to requirements. Through information on the actual energy consumption during production in relation to set reference values, an energy point is calculated.

The energy calculation covers the entire paper product; both the paper production and the pulps used. Fillers in paper and transport of raw materials as well as within the factory area shall not be included in the energy calculation.

Non-integrated pulp mill

Electricity

The calculations must include both purchased and on-site produced electricity.

Electricity = on-site produced electricity + purchased electricity - sold electricity.

The calculation of electricity consumption must be based on invoices and readings from electricity meters. On-site produced electricity is documented using readings from electricity meters. The requirement covers all processes from debarking to drying the pulp. An exemption applies to electricity for offices or lighting in the factory area. The average electricity consumption can be used for all pulps if the pulp mill only produces pulps of equivalent quality using the same type of process.

Fuel

The calculation must include both purchased fuel and fuel produced at the plant, divided into renewable and fossil fuels. The pulp producer must report the fuel used for on-site generated electricity and should deduct the fuel for electricity before reporting it to the paper manufacturer. The paper manufacturer deducts the fuel consumption from internally produced electricity using a factor of 1.25 in its own energy calculation.

Fuel pulp = fuel produced at the plant + purchased fuel - sold fuel * (sold fuel and/or heat/0,8)

The amount of fuel purchased must be adjusted to the quantities at the start and end of the current year. Consumption of internally produced fuel from bark, shavings and other wood residues is calculated using the thermal values for the fuels used or measured.

* *Excess energy*

Excess energy sold in the form of electricity, steam or heat is subtracted from the total consumption. The amount of fuel used to produce electricity or heat is calculated by dividing the sold electricity or heat by 0.8. This is equivalent to an average efficiency for the total production of electricity and heat.

Alternatively, the actual efficiency of the plant in the conversion of fuel to heat energy can be used.

Verification

An overview of the factory's energy supply system showing the number of boilers, with information about the boiler effect and which fuel is used.

Report on the amount of purchased, on-site produced and sold electricity.

Report on the amount of purchased, on-site produced and sold fuel/heat

Conversion factors and efficiency must be stated if thermal energy has been re-calculated to fuel.

The calculation sheet produced by Nordic Ecolabelling can be used.

Non-integrated paper mill

Electricity

The calculations must include both purchased and on-site produced electricity.

Electricity = on-site produced electricity + purchased electricity - sold electricity.

The calculation of electricity consumption must be based on invoices and readings from electricity meters. On-site produced electricity is documented using readings from electricity meters. The requirement covers all processes from pulping to drying the base paper. An exemption applies to electricity for offices or lighting in the factory area. The average electricity consumption can be used for all paper if the paper mill only produces paper of equivalent quality using the same type of process.

Fuel

All purchased fuel must be included in the calculations, divided into fossil and renewable fuels.

Fuel paper = purchased fuel - sold heat converted to excess energy*

The amount of purchased fuel must be adjusted to the quantities at the start and end of the current year.

* *Excess energy*

Excess energy sold in the form of electricity, steam or heat is subtracted from the total consumption. The amount of fuel used to generate electricity or heat that is sold off is calculated by dividing the sold electricity or heat by 0.8. The coefficient of 0.8 is equivalent to the average energy efficiency for total heat and electricity production. Alternatively, the actual energy efficiency of the plant in the conversion of fuel to heat energy can be used.

Verification

An overview of the paper machinery's energy supply system showing the number of boilers, with information about the boiler effect and which fuel is used.

Report on the amount of purchased, on-site produced, and sold electricity.

Report on the amount of purchased, on-site produced, and sold fuel/heat.

Conversion factors and efficiency must be stated if thermal energy has been re-calculated to fuel.

The calculation sheet produced by Nordic Ecolabelling can be used.

Steam

If excess steam from another production process is used (e.g. from another industry), the energy content of the steam must be included in the calculation. In this case, Table 1, the steam table should be used. If steam from electric boilers is used, the energy content must be converted to fuel in the same way, but the energy content must be multiplied by 1.25.

Energy calculation, paper production

Energy score for paper production

Energy scores for $P_{paper(electricity)}$ and $P_{paper(fuel)}$ for paper production are calculated using the following formulas:

$$P_{paper\_electricity} = \frac{Electricity_{consumed}}{Electricity_{reference}}$$

$$P_{paper\_fuel} = \frac{Fuel_{consumed} - 1.25 \cdot in - house\ generated\ electricity}{Fuel_{reference}}$$

The following reference values for kraft paper must be used:

$Electricity_{reference}$ = 1600 kWh/ADt

$Fuel_{reference}$ = 2100 kWh/ADt

Verification

Calculation of energy score. The calculation sheet produced by Nordic Ecolabelling can be used.

Energy score when a mixture of different pulp types are used

The following formulas are used to calculate the energy score when a mixture of different pulp types is used:

$$P_{pulp\_electricity} = \sum_{i=1}^{n} P_{pulp\_electricity\_i} \cdot pulp_i$$

$$P_{pulp\_fuel} = \sum_{i=1}^{n} P_{pulp\_fuel\_i} \cdot pulp_i$$

$Pulp_i$ is the percentage of the individual pulp relative to the total pulp mixture. Due to wastage and differences in water content, the total of the pulp may be greater than 1. P pulp(electricity)i is the energy score for electricity for pulp i. P pulp(fuel)i is the energy score for fuel for pulp i.

Verification

Calculation of energy score. The calculation sheet produced by Nordic Ecolabelling can be used.

Total energy score for paper and pulp production

The total energy score for both electricity and fuel consumption for the paper production, including pulp production, is calculated using the formulas below:

$$P_{electriciy} = P_{electriciy\_pulp} + P_{electriciy\_paper}$$

$$P_{fuel} = P_{fuel\_pulp} + P_{fuel\_paper}$$

The amount of fuel used to produce electricity in the pulp mill must be deducted by the paper manufacturer from the values received from the pulp producer using a factor of 1.25.

Worst case calculations must be included to show that each pulp recipe meets the requirements if no specific calculations are reported for each pulp mixture.

Verification

The documentation must include calculations with sub-totals. The base values used for consumed fuel and electricity must be stated. Worst case calculations must be included to show that each pulp recipe meets the requirements if no specific pulp-mixture calculations are reported for each pulp mixture present. The calculation sheet produced by Nordic Ecolabelling can be used.

Energy score for pulp production

Energy scores for P pulp(electricity) and P pulp(fuel) for paper production are calculated using the following formulas:

$$P_{pulp\_electricity\_i} = \frac{Electricity_{consumed}}{Electricity_{reference}}$$

$$P_{pulp\_fuel\_i} = \frac{Fuel_{consumed} - 1.25 \cdot in - house\ generated\ electricity}{Fuel_{reference}}$$

The table below shows the reference values for electricity and fuel:

Table 1 Reference values pulp

Process	Fuel kWh/t, Ref. value	Electricity kWh/t, Ref. value
Bleached chemical pulp	3600	650
Dried, bleached chemical pulp	4600	700
Unbleached chemical pulp	3200	550
Dried, bleached chemical pulp	4200	600
NSSC	3200	700
Dried NCCS	4100	750
CTMP	N/A	1500

Dried CTMP	900	1500
DIP	300	450
Dried DIP	1200	500
TMP	N/A	2200
Dried TMP	900	2250
Slip	N/A	2000
Dried slip	900	2050

Verification

Calculation of energy score. The calculation sheet produced by Nordic Ecolabelling can be used.

Table 2 Steam table

Enthalpy in gauged steam, h´´, as a function of absolute pressure, p or temperature, t. Enthalpy is divided by an efficiency of 0.9 and added to the heat consumption.

p Bar	t 0C	h´´ KJ/kg	p bar	t 0C	h´´ KJ/kg
0.50	81.3	2646.0	16.0	201.4	2791.7
0.60	86.0	2653.6	17.0	204.3	2793.4
0.80	93.5	2665.8	18.0	207.1	2794.8
1.00	99.6	2675.4	19.0	209.8	2796.1
1.20	104.8	2683.4	20.0	212.4	2797.2
1.40	109.3	2690.3	22.0	217.2	2799.1
1.60	113.3	2696.2	24.0	221.8	2800.4
1.80	116.9	2701.5	26.0	226.0	2801.4
2.00	120.2	2706.3	28.0	230.1	2802.0
2.50	127.4	2716.4	30.0	233.0	2802.3
3.00	133.5	2724.7	32.0	237.5	2802.3
3.50	138.9	2731.6	34.0	240.9	2802.1
4.00	143.6	2737.6	36.0	244.1	2801.7
4.50	147.9	2742.9	38.0	247.3	2801.1
5.00	151.8	2717.5	40.0	250.3	2800.3
6.00	158.8	2755.5	45.0	257.4	2797.7
7.00	165.0	2762.0	50.0	263.9	2794.2
8.00	170.4	2767.5	55.0	269.9	2789.9
9.00	175.4	2772.1	60.0	275.6	2785.0
10.00	179.9	2776.2	65.0	280.8	2779.5
11.00	184.0	2779.7	70.0	285.8	2773.5
12.00	188.0	2782.7	80.0	295.0	2759.9
13.00	191.6	2785.4	90.0	303.3	2744.6
14.00	195.0	2787.8	100.0	311.0	2727.7
15.00	198.3	2789.9	110.0	318.1	2709.3

Source: Thermal Engineering Data, which refers to Schmidt, E.: Properties of water and Steam in SI.Units, 1969. Springer-Verlag and R. Oldenbourg 1969.

Appendix 3 Energy calculations

Energy calculation for production of panels made from renewable raw materials; wood- and lignocellulose based panels, CLT, glulam and laminate.

The following applies to the energy calculation in the production of wood- and lignocellulose panels and mouldings, CLT, glulam and laminate:

1. Energy consumption is calculated as an annual average for either just the ecolabelled production or for the whole enterprise that is relevant for Nordic Swan Ecolabelled panels, CLT, glulam and laminate.
2. The energy consumption is calculated as MJ/kg per panel/product, and encompasses all energy used from gate to gate at the panel production site. Separate energy consumption also needs to be calculated for production for pulp/paper and laminate (if they comprise more than 5% wt% of the panel/product).
3. Processes included in the calculation:
   Chipping, refining, drying, blending (production of any adhesive; see 4), forming, pressing, any lamination of the panel, cooling, trimming, sanding, surface treatment, and packaging.
4. In the case of the production of chemical products, for example adhesive, the energy accounts must be based on data for production. The energy content of the raw material must not be included in the calculation. In exceptional cases a standard value of 15 MJ/kg (solution for use) for adhesive may be used, broken down as 12 MJ/kg for fuel and 3 MJ/kg for electricity purchased from an outside supplier (4:1).

Example of a calculation using the standard value for adhesives:

A panel contains 12% adhesive (solution for use). This represents 0.12 kg of adhesive solution for use per kilogram of panel. Applying the standard value in the calculation of energy points for adhesive results in 0.12 kg adhesive/ kg panel x 15 MJ/ kg adhesive = 1.8 MJ/ kg panel.

5. Energy consumption in the production of laminate (compact laminate and HPL) includes the production of resin/glue, the process of handling paper (dipping in resin/drying process), stacking of paper/laminate, pressing, heating, cooling, trimming, sanding and packaging. Production of paper has its own requirement.
6. The calculation includes the actual energy consumed (electricity and heat) in production without the use of primary energy factors. Self-produced energy and excess energy that is sold off should be stated but does not count as consumed energy in the calculation.

System boundary for the requirement: Energy consumption for obtaining raw material and transport of raw materials to sawmill/production site, is not included in the calculation.

Energy calculation for production of panels made from mineral- and non renewable raw materials; panels made from recycled composite, gypsum plasterboards, mineral wool-based acousitc panels, cement-based panels, panels made from other materials and production of mineral wool and cement.

The following applies to the energy calculation in the production of panels made from recycled composite, gypsum plasterboards, mineral wool-based acoustic panels, cement base panels, panels made from other materials and production of the raw materials: mineral wool and cement.

1. Energy consumption is calculated as an annual average for either just the ecolabelled production or for the whole production site that is relevant for Nordic Swan Ecolabelled panels.

2. The energy consumption is calculated as MJ/kg product produces, and encompasses all energy used from **gate to gate** (phase A3 in EPDs) at the panel production site. Separate energy consumption also needs to be calculated for production of the following raw materials: cement, mineral wool, paper, and laminate (if they comprise more than 5 wt% of the plate).

3. Processes included in the calculation:

   Raw material preparation (crushing/grinding/chipping), refining, blending, forming, heating, pressing, gluing/laminating different types of material layers together, facing the panels, surface treatment, cooling, trimming, and packaging.

4. The calculation includes the actual energy consumed (electricity and heat) in production without the use of primary energy factors. Self-produced energy and excess energy that is sold off should be stated but does not count as consumed energy in the calculation.

5. **System boundary for the requirement:** Energy consumption for extraction of raw materials and transports of raw materials is not part of the energy requirement. The energy requirement for production of raw materials do not apply to raw materials that are included by less than **5 wt%** of the panel.

Appendix 4 RPS analysis

The RPS analyses is based on existing RPS analysis from generation 6 of criteria for Nordic Ecolabelling of Construction and facade panels, and mouldings.

RPS analysis for wood-based panels

Overall priority	Area and level indication (high – medium – low) for R, P and S	Comments
High	**Resources – wood raw material** High R, high P, high S	High RPS for requirement for sustainable virgin- or recycled wood raw material.
	Energy – material and panel production High R, medium to high P, medium to high S	High RPS has been identified for the energy impact of panel production and drying of wood raw material. The actual adhesive production also contributes a significant part of the energy impact. Here it is the production of the raw materials that requires energy, not the mixing of the adhesive. Steerability is therefore only medium, as there are several links further back in the product chain and the potential has been unclear.
	Chemicals – general High R, medium P, high S	The chemical requirements apply to all chemical products used in panel production. Here the assessment is that formaldehyde, VOC and isothiazolinones in the binders have the highest relevance. Also ensuring low content of problematic chemicals in surface treatments, e.g., VOC, flame inhibitors, heavy metals in pigments. Also, a high RPS for requirements limiting the use of nanoparticles, for instance in surface treatments.
	Chemicals – formaldehyde High R, high P, high S	Here there is high RPS for requirements concerning formaldehyde, both in the form of reduced formaldehyde emissions in the use phase and reduced free formaldehyde in the chemical products used, e.g., adhesives.
	Quality and properties High R, high P, medium S	Here there is RPS for ensuring conformity between the properties and functions for which the panels are marketed, and the performance declarations drawn up as part of the CE marking. There is also RPS for ensuring that panels not covered by harmonised product standards also have documentation for the properties and functions for which the panel is marketed.
Medium	**Resources – bio-based adhesives** High R, low P, low S	There is a low to medium RPS for requirements for bio-based adhesives. Work is ongoing to develop bio-based adhesives. These are not particularly widespread yet, and the potential and steerability are therefore judged to be low at the present time. This will be a possible future requirement.
Low	**Resources – waste phase** High R, medium to low P, low S	Wood-based panels have a generally high calorific value (17–20 MJ/kg) and are suitable for incineration with energy recovery. For some types of wood-based panels, material recovery will be relevant.

RPS analysis for HPL panels

Overall priority	Area and level indication (high – medium – low) for R, P and S	Comments
High	**Resources – wood raw material** High R, high P, high S	High RPS for requirement for sustainable virgin- or recycled wood raw material in the paper.
	Energy – material production (wood raw material) High R, medium to high P, medium S	In Nordic Ecolabelling's experience, there is RPS for energy for paper, and therefore specific energy requirements can be set for the paper used.
	Energy – panel production High R, medium to high P, high S	Here, high relevance has been identified for energy impact from panel production. HPL panel production is a very energy-intensive production type. At the same time, high potential has been identified for reducing energy consumption in production.
	Chemicals – pigments, VOC, biocides and other High R, medium P, high S	The chemical requirements are applied to all chemical products used in panel production. Here it is assessed that formaldehyde, VOC and isothiazolinones in the binders have high relevance, as does ensuring low content of problematic chemicals in the surface treatment, e.g., VOC, flame inhibitors, heavy metals in pigments. Also, a high RPS for requirements limiting the use of nanoparticles, for instance in the surface treatments.
	Quality and properties High R, high P, medium S	Here there is RPS for ensuring conformity between the properties and functions for which the panels are marketed, and the performance declarations drawn up as part of the CE marking. There is also RPS for ensuring that panels not covered by harmonised product standards also have documentation for the properties and functions for which the panel is marketed.
Medium	**Energy – material production (resin)** High R, low to medium P, medium to low S	High relevance has been identified in relation to energy impact from material production, including raw material extraction. All the constituent materials are highly processed, with correspondingly high energy consumption. The potential for energy reduction in the production of phenolic and melamine resin is unclear. The different HPL production systems use much the same material types without wide variations in material proportions.
	Chemicals – resins High R, low to medium P, medium to low S	No potential or steerability has been identified for substituting the phenolic and melamine resins used, as these are essential for the panel type. However, requirements can be set to ensure low emission values during production.
Low	**Resources – waste phase** High R, medium to low P, low S	HPL panels have a generally high calorific value (17–20 MJ/kg) and are suitable for incineration with energy recovery. Material recovery is not considered very relevant for HPL, as the materials are strongly combined in the lamination process, making such recovery difficult. The lamination process is essential for the panel type, so no great potential for further resource requirements is envisaged, other than requirements for energy and sustainable or recycled wood raw material.

RPS Anaysis for plasterboards

Overall priority	Area and level indication (high - medium - low) for R, P and S	Comments
High	**Emissions - dust emissions** High R, medium P, medium to high S	There is high RPS for requirements for dust emissions from the production of mineral raw materials.
	Energy - panel production Medium to high R, medium to high P, high S	Here, medium to high RPS has been identified in relation to energy impact from panel production. There is a potential for recycling heat from production processes.

	Chemicals - VOC, biocides and other High R, medium P, high S	The chemicals requirements are applied to all chemical products used in panel production. Here there is judged to be high relevance for substances such as the additives and coatings used in the plasterboard. E.g., formaldehyde, VOC and isothiazolinones in binders.
	Quality and properties High R, high P, medium S	Here there is RPS for securing conformity between the properties and the functions for which the panels are marketed and the performance declarations drawn up in relation to the CE marking. There is also RPS for ensuring that panels not covered by harmonised product standards also have documentation for the properties and functions for which the panel is marketed.
	Resources - gypsum extraction High R, High P, medium S	The R and P for responsible sourcing of virgin mineral raw materials from quarries are high. The mineral industry has been working with both traceability- and biodiversity management and rehabilitation plans for several years. Certification schemes for sustainable mining are however still under development and S has therefor been assessed as medium.
Medium	**Resources - water** Medium R, medium P, medium to high S	There is medium RPS for setting requirements for a recycling system for water in panel production. Water is used in plasterboard production both as a binder and as a mixer.
	Resources - gypsum raw materials - feedstock High R, medium P, low to medium S	Here there is medium RPS for setting requirements for a minimum proportion of recycled gypsum from demolition and refurbishment of buildings in panel production. This will ensure that the production system can handle recycled gypsum and ensure that recycled gypsum is not used for other purposes with less environmental benefit, e.g., composting. The quantity of recycled gypsum from coal-fired power plants (FDG gypsum) is strongly reduced in the market due to the power plants use of alternative raw materials than coal.
	Resources - wood raw materials Low to medium R, high P, high S	For paper where more than 15% by weight is used. High RPS for requirement for sustainable or recycled wood raw materials in the paper. This requirement will rarely be activated on plasterboards, as there is generally max. 5% by weight paper in the panel.
	Resources - gypsum raw materials - waste phase High R, medium to low P, low S	Here there is judged to be medium RPS for encouraging reuse of the plasterboard material after final use and for providing information to customer that plasterboard waste can be reused, as can any dismantled old plasterboard.

RPS analysis of mineral wool panels

Overall priority	Area and level indication (high - medium - low) for R, P and S	Comments
High	**Resources - mineral raw materials** High R, high P, high S	High RPS for requirement for recycled mineral raw materials in the panel.
	Resources - wood raw materials High R, high P, high S	High RPS for requirement for sustainable virgin- or recycled wood raw materials in the paper.
	Energy - materials production (wood raw materials) High R, medium to high P, medium S	In Nordic Ecolabelling's experience, there is RPS for energy for paper, and therefore specific energy requirements can be set for the paper used. RPS for requirements where more than 15% by weight is used.
	Energy - panel production High R, medium to high P, high S	High RPS has been identified for the energy impact of panel production and the actual mineral wool production.
	Emissions - dust emissions High R, medium P, medium to high S	There is high RPS for requirements for dust emissions from the production of mineral raw materials.
	Chemicals - pigments, VOC, biocides and other	The chemicals requirements are applied to all chemical products used in panel production. Here it is assessed that formaldehyde, VOC and

	High R, medium P, high S	isothiazolinones in the binders have the highest relevance. Also securing a low content of problematic chemicals in the surface treatment, e.g., VOC, flame inhibitors, heavy metals in pigments.
	Resources - mineral raw materials High R, medium P, medium S	There is medium to high RPS for requirements for radioactive substances and heavy metals in virgin mineral raw materials for acoustic panels. Controllability is slightly lower for recycled mineral raw materials and waste raw materials such as slag and fly ash, but the relevance is still high and there is an overall medium to high RPS.
	Quality and properties High R, high P, medium S	Here there is RPS for securing conformity between the properties and the functions for which the panels are marketed and the performance declarations drawn up in relation to the CE marking. There is also RPS for ensuring that panels not covered by harmonised product standards also have documentation for the properties and functions for which the panel is marketed.
Medium	**Resources - binders** Medium R, medium P, medium to low S	There is medium RPS for replacing fossil fuel binders with bio-based binders in the panel. Potential and controllability are currently unclear. There must be a focus on this for a requirement in the future.
	Energy - materials production (resin) Medium R, low to medium P, medium to low S	There is a total low to medium RPS for energy requirements for binders. Here no requirements are set in this version of the criteria.
Low	**Resources - waste phase** High R, medium to low P, low S	Materials reuse is found to be of high relevance and takes place with some panels. The controllability of encouraging this further with a requirement is low. Instead, the controllability lies in ensuring that no problematic substances are included by means of the chemical requirements.

RPS analysis of cement-based panels

Overall priority	Area and level indication (high - medium - low) for R, P and S	Comments
High	**Resources - mineral raw materials** High R, high P, high S	High RPS for requirements for a high proportion of recycled mineral raw materials in the panel.
	Resources - renewable raw materials High R, high P, high S	High RPS for requirements for a certain proportion of renewable or recycled raw materials in the panel.
	Resources - wood raw materials High R, high P, high S	Here a high RPS has been identified for ensuring that the wood fibres are either certified, sustainable, or recycled.
	Energy - materials composition High R, medium to high P, medium S	High RPS has been identified for energy requirements affecting both material production and panel production. The highest RPS for material production is found to exist in relation to the actual material composition, as here a high potential can be identified for reducing the use of the most energy and CO2 intensive materials.
	Energy - panel production High R, medium to high P, high S	Here, high RPS has been identified for energy impact from panel production.
	Chemicals - dust emissions High R, medium P, medium to high S	There is high RPS for requirements for dust emissions from the production of mineral raw materials.
	Chemicals - pigments, VOC, biocides and other High R, medium P, high S	The chemicals requirements are applied to all chemical products used in panel production. Here it is assessed that formaldehyde, VOC and isothiazolinones in the binders have the highest relevance. Also securing a low content of problematic chemicals in the surface treatment, e.g., VOC, flame inhibitors, heavy metals in pigments. Also, a high RPS for requirements limiting the use of nano particles, for instance in the surface treatments.

	Resources - mineral raw materials High R, medium P, medium S	There is medium to high RPS for requirements for radioactive substances and heavy metals in virgin mineral raw materials for acoustic panels. Controllability is slightly lower for recycled mineral raw materials and waste raw materials such as slag and fly ash, but the relevance is still high and there is an overall medium to high RPS.
	Quality and properties High R, high P, medium S	Here there is RPS for securing conformity between the properties and the functions for which the panels are marketed, and the performance declarations drawn up in relation to the CE marking. There is also RPS for ensuring that panels not covered by harmonised product standards also have documentation for the properties and functions for which the panel is marketed.
Medium		
Low	**Energy - materials production** High R, high P, low S	Low to medium RPS has been identified for a requirement for production-specific energy consumption for all constituent materials.
	Resources - waste phase High R, medium to low P, low S	Materials reuse is found to be most relevant and takes place with some panels. However, this is mainly as down cycling to road fill. The controllability of encouraging this further with a requirement is low. Instead, the controllability lies in ensuring that no problematic substances are included by means of the chemical requirements.