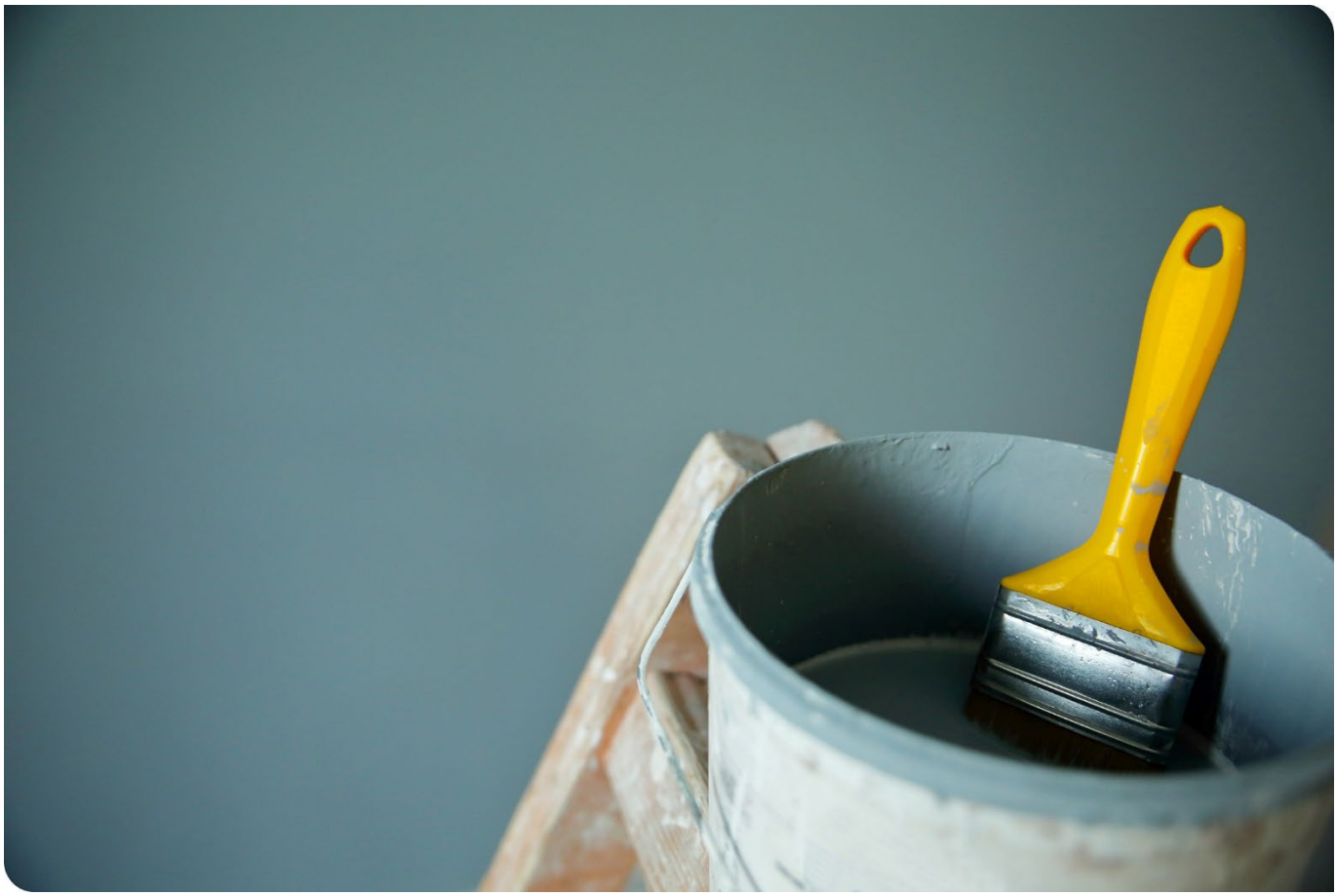
About Nordic Swan Ecolabelled

Paints and varnishes



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Background document

Nordic Ecolabelling

Content

096 Paints and varnishes, version 4.6, 14 October 2025

Contact information

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:

Denmark
Ecolabelling Denmark
www.svanemaerket.dk

Finland
Ecolabelling Finland
www.joutsenmerkki.fi

Sweden
Ecolabelling Sweden
www.svanen.se

Iceland
Ecolabelling Iceland
www.svanurinn.is

Norway
Ecolabelling Norway
www.svanemerket.no

1 Summary

Nordic Swan Ecolabelling of paints and varnishes is highly relevant. Sustainable coatings concepts have evolved significantly since they were introduced decades ago. Almost every business operation today considers sustainability aspects, often daily. In addition to reducing volatile organic compounds (VOCs), the focus has expanded to include energy conservation, waste minimization, process efficiency enhancement, and the use of renewable materials. Additionally, companies consider the social impacts of their activities throughout the value chain.

Updated chemical requirements

Ingoing substances that are classified as environmental hazardous have been tightened in this version of the criteria. Furthermore, the limit for preservatives for outdoor paints and varnishes has also been tightened.

In this generation of chemical requirements, a definition of constituents is used which means a ban on specific constituents down to 0 ppm, just like in the previous generation. As such, a safety data sheet alone is not enough to meet the documentation requirement. Further information about the chemicals will always be needed. Other certifications that do not require chemical documentation down to the same level will therefore not be permissible as documentation for these requirements.

The requirement for formaldehyde, VOCs, and Semi-Volatile Organic Compounds (SVOC) has been updated with emission testing to better protect the consumer from exposure.

Nordic Ecolabel has introduced a new dynamic criterion for endocrine disrupters that are identified or suspected as endocrine disruptors across different legislations or national evaluations.

Requirements for energy and CO_2-reduction

The criteria have been expanded with requirements focused on reducing the climate impact of raw material production with a high energy consumption, by introducing energy efficiency requirement such as certification or limit values for CO_2-emissions.

Requirements for renewable raw materials

The criteria have introduced a supply chain policy for the manufacturer and a code of conduct for responsible sourcing of renewable raw materials.

Paints and circular economy

The criteria have introduced several requirements for packaging to promote circular economy. This includes use of recycled material in packaging and making it more clear to consumer how to recycle the packaging at the end of life.

2 Environmental impact of paints and varnishes

The criteria for Nordic Swan Ecolabel paints and varnishes are based on the principles of life cycle assessment and RPS[1] (Relevance, Potential and Steerability) analysis. Additionally, the European Commission product environmental footprint (PEF) pilot for paints[2] has been used as a reference when developing the RPS in order to better identify the major impacts of paints and varnishes during the entire lifecycle.

2.1 RPS-analysis

The following table shows the major impacts identified for the RPS-analysis, where it is concluded if Nordic Swan Ecolabel can set requirements to maximise the total environmental benefit of the criteria.

Raw material stage	RPS level (high-medium-low)	Comment
Titanium dioxide	R = High P = High S = High	Titanium dioxide has one of the greatest overall environmental impacts for paints, while being an important part for the performance of the paint formulation. There is a high energy demand[3] to produce titanium dioxide and it is characterized by intensively consumption of resources and use of coal or electrical energy and is accompanied by a large amount of waste, chemical[4] and energy emissions. The potential lies in different manufacturing processes and energy efficient measures to reduce the energy demand, where the steerability can ensure that titanium dioxide is produced with the least waste generation and environmental impacts[5]. Nordic Ecolabel sets requirements to reduce waste produced from the production of titanium dioxide. Furthermore, requirement focuses on certification of manufacturing plants that work extensively with energy reduction and energy efficient measures in order to reduce their overall climate impact from the production of titanium dioxide.
Acrylate resins: Feedstock in polymer production	R = High P = High S = High	Traditional paints are derived from fossil fuels, and as the production of paints are increasing, so does the demand for petrochemicals and results in depletion of finite resources. Furthermore, fossil fuels are a contributor to local air pollution, which have both a negative environmental and health impact. Also, the manufacture of biobased polymers is of high relevance[6,7]. Various bioplastics are made from sugars and starches harvested from crops that would otherwise be grown for food. By decreasing the amount of available land for food production, the bioplastics industry can lead to an increase in the cutting down of forested areas for arable land. Cutting down forests decreases carbon dioxide uptake and biodiversity and increases risks of erosion and flooding. The potential here lies in promoting the use of more renewable materials and biobased materials[8,9], to lower the effects that would have risen from binders made from petrochemicals.

1 https://www.nordic-ecolabel.org/nordic-swan-ecolabel/criteria-process/rps-tool/
2 https://ec.europa.eu/environment/eussd/smgp/documents/PEFCR_Decorative%20Paints_Feb%202020.pdf
3 https://iopscience.iop.org/article/10.1088/1757-899X/678/1/012113/pdf
4 Environmental Impact of Coated Exterior Wooden Cladding - Hakkinen et al, VTT Building Technology, 1999
5 Middlemas, S., Fang, Z. Z., & Fan, P. (2015). Life cycle assessment comparison of emerging and traditional Titanium dioxide manufacturing processes. Journal of Cleaner Production, 89, 137-147.
6 Michel Biron, in Thermoplastics and Thermoplastic Composites (Third Edition), 2018
7 https://www.european-bioplastics.org/how-much-land-do-we-really-need-to-produce-bio-based-plastics/
8 https://www.pcimag.com/articles/109592-teknos-joins-project-to-develop-bio-based-binders-and-coatings#
9 https://www.pcimag.com/articles/103863-biobased-polymers-for-sustainable-coatings

		Nordic Ecolabel sets requirement for manufacturers of paint to have routines for working continuously with strategic goals to increase their use of resins made from renewable raw materials. The requirement sets a pathway that can help promote saving fossil fuels and reduce greenhouse gas emissions. There is also steerability in setting requirements for waste or residues as preferred renewable material to avoid compete with food feedstock [10] by using certified renewable materials in accordance with Certification by Renewable Energy Directive of the EU Commission, which are subject to strict criteria regarding emission savings and being sustainable.
Acrylate resins: Energy demand in polymer production	R = High P = Medium S = Low	There is a high energy demand for polymer production as the conversion of basic raw materials to final polymers requires high amounts of electrical power for thermal energy. Furthermore, the source for the energy is mainly from conventional fossil carbon-based resources such as coal, petrol or natural gas, which results in the emissions of greenhouse gases. The potential for improvement relies on reducing the energy demand, introducing energy efficient measures and increase the use of renewable energy in order to meet the objective of a climate neutral Europe. For a requirement to be introduced for Nordic Ecolabel Paints, there are steerability issues regarding energy demand as it depends on variables such as energy infrastructure, climate zone and ambient temperature [11] which can differ depending on production site location throughout Europe. Hence, there is no requirement on this topic.
Alkyd reins	R = High P = High S = Medium	There is a relevance for the cultivation of alkyds derived from vegetable oil, as it is directly related to land use, land transformation and biodiversity. There are environmental impacts when burning the biomass in connection to the land transformation with reduction in carbon stored in forests, plants and soil and followed by the release of carbon from combustion. In general, vegetable oil can be converted into alkyd resin, however each raw material should be studied separately. The raw materials to produce alkyd resins are also used as food ingredients, so it is necessary to seek out alternative plants that are not in competition with land-use and food producers [12]. The potential here lies in promoting the use of alkyds derived from non-food competing vegetable oils, such as tall oil fatty acids which do not contribute to increased land use and reduction of carbon stored as the potential lies in promoting the use of waste products. As with acrylic resins the general environmental benefit of bio-based plastics come from the shift from fossil feedstock to bio-based feedstock. Nordic Ecolabel sets requirement for manufacturers of paint to have routines for working continuously with strategic goals to increase their use of resins made from renewable raw materials. The requirement sets a pathway that can help promote saving fossil fuels and reduce greenhouse gas emissions. There is also steerability in setting requirements for waste or residues as preferred renewable material to avoid compete with food feedstock.
Cement and alternative hydraulic binders	R = High P = High S = Medium	Portland cement being the key ingredient in cement-based paints, is also one of the major sources of greenhouse gases. Portland Cement accounts for 5% of carbon dioxide emissions [13], 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 cement/hydraulic binder to limit the anthropogenic emissions of CO_2.
Feedstock for packaging	R = High P = Medium	There is a relevance for plastic material and metal used as virgin material have a heavy climate impact. Furthermore, left-over paint

10 https://www.johannebergsciencepark.com/sites/default/files/Final%20report%20-%20Value%20chain%20adhesives%20and%20paint.pdf
11 Khripko, D., et al (2016) Energy demand and efficiency measures in polymer processing: comparison between temperate and Mediterranean operating plants.
12 Eco-friendly Alkyd Resins Based on Vegetable Oil: Review
13 The Cement Sustainability Initiative: https://docs.wbcsd.org/2016/12/GNR.pdf (visited 2022-05-30)

	S = High	residue from incorrectly disposed paint can make the packaging difficult to recycle. Nordic Ecolabel sets out requirements to encourage the use of recycled material in packaging to reduce the dependency of fossil feedstock and to promote circular economy.
Production	**RPS level (high-medium-low)**	**Comment**
Chemicals that are harmful to the health and environment	R = High P = High S = High	Chemicals used on the manufacturing plant and for the production of paints and varnished contain many difference substances and raw materials with many different harmful effects on the environment and health. Nordic Ecolabel sets requirements to produce paints to protect the worker and to limit the use of harmful substances during production. Furthermore, Nordic Ecolabel sets requirements for the production of paints to protect the worker in the working environment to reduce exposure to dust and to promote good working conditions.
Emissions & Energy use	R = Medium P = High S = Medium	There is a relevance for the production of paints regarding indirect and direct emissions which are related to energy use. Indirect emissions being emissions from the combustion of fossilised fuels from another entity to power the electrical grid used for the processes at the manufacturing plant. These emissions occur because of the activities used for the manufacturing of the paint, i.e., emissions from consumption of a purchased electricity, heat, or steam. Energy use in paint manufacturing consists of among others heating, ventilation and air conditioning (HVAC), local exhaust ventilation (LEV), electricity to power the processes, mechanical or wet grinding and mixing to create homogenous dispersions. When blending paint ingredients, several milling steps may be needed due to re-work in order to achieve proper homogenous dispersion. There are several ways to increase energy efficiency in paint manufacturing, examples such as making the milling step more energy efficient, replacing old equipment or identifying locations with high energy use. It is unclear how significant the impact of paint manufacturing is compared to the overall impact of the paint. However, since the major environmental impact of the paint is within the supply chain of the paint manufacturer, requirements are prioritized there rather at the paint manufacturer.
Use	**RPS (high-medium-low)**	**Comment**
Exposure to chemicals that are harmful to the environment	R = High P = High S = High	Since consumers in the use phase are normally less protected and less knowledgeable about hazards than employees in the production phase, it is relevant to set strict requirements to limit the exposure to consumers of harmful chemicals, via inhalation or skin contact. Nordic Ecolabel sets strict requirements regarding ingoing substances, with a zero-tolerance policy. Furthermore, by updating the requirement for endocrine disruptors, Nordic Ecolabel can ensure that a strict policy is applied to protect consumers from endocrine disruptors. Additionally, good indoor quality is required for the consumer to be protected from emissions of volatile and semi-volatile organic compounds after the paint is applied.
Preservatives and environmental harmful substances	R = High P = High S = High	There is relevance to substances that are harmful to the environment, including biocides which are also harmful to the health while still maintaining acceptable levels to efficiently preserve the paint and prolong its shelf-life. Nordic Ecolabel sets strict requirements to environmentally harmful substances as there are issues with unused paint is properly disposed of. The purpose of restricting environmentally harmful substances is to reduce the ability for such substances to intentionally or unintentionally be emitted to water, for example when washing brushes and tools.
Microplastics	R = High P = Medium S = Low	There is a relevance to primary and secondary microplastic discharge, as the DIY-business may contribute to primary microplastic sources by rinsing tools and brushes in water and contribute to secondary microplastic from fragmentation and particle release.

		There is a potential and some steerability to include requirements on labelling to instruct the consumer on how to properly wash tools and brushes and dispose of paints that are fragmented or sanded. While biobased polymers can reduce the overall environmental footprints of paints, they do not contribute to the microplastic reduction as they are still synthetic polymers. A requirement for primary microplastic emissions at the production plant shows low steerability as the paint manufacturer must send all processing water in accordance with legislation to an environmental and recycling company for remediation of the water before it enters the municipal waste system. Additionally, more clarifying labelling will be required for packaging to inform the consumer on how to properly dispose of unused paints as to not contribute to microplastic spread. Secondary microplastic may be difficult to introduce a requirement for as the final coating applied may have microplastic emissions spread out over its lifetime for many years. Nordic Ecolabel instead sets out requirement for more longer durable paints, as durability is considered one of the most promising paint characteristics to reduce microplastic emissions.[14]
Performance	R = High P = High S = High	There is a high relevance to paint performance as during use-phase its application affects the amount of paint needed to cover a surface, or its durability before the next repainting period. Nordic Ecolabelling sets strict quality requirements for high performing paints in order to increase the repainting period of paints. By doing this, the resource use of paints decreases as the substrate does not have to be repainted so often, and less frequent repaints results in a lower overall environmental impact.
Waste		
	R = Medium P = Medium S = Low	It is common to both recycle and reuse building materials. This is, however, governed by the building material itself and not the surface treatment of paint or varnish. The building material may comprise of several different materials. It is therefore not practical to consider whether the paint or varnish is recycled or reused, since it is the building material itself that steers the whole recycling process. This phase is therefore extremely difficult to assess and thus the relevance of setting direct requirements for this waste phase is low. Nordic Ecolabelling's requirements to ingoing substances and their classifications steer the products toward it being more likely to recycle/reuse them. It is, however, relevant to consider the residues that remain in tins/packs of used paints and varnish. These can vary in quantity and content, depending on how they are used.

2.2 UN’s Sustainable Development Goals

The UN Sustainable Development Goals (SDGs, Global Goals) are a universal call to action to fight poverty and inequalities, protect the planet and tackle climate change by 2030. The Nordic Swan Ecolabel is a powerful tool for securing a sustainable future. The Nordic Swan Ecolabel actively contributes to reach goal 12: responsible consumption and production. Nordic Swan Ecolabelled paints and varnishes have reduced environmental impact from production and use, and the requirements ensure high quality products that are long-lasting, durable and in a life cycle perspective reduce paint.

14 Faber et al. (2021) Paints and microplastics Exploring recent developments to minimise the use and release of microplastics in the Dutch paint value chain. RIVM report 2021-0037

Nordic Swan Ecolabel paints and varnishes contributes to Goal 12 as follows:

- **Strict requirements for chemicals and emissions** limit the release of harmful substances to air and water and improve indoor air quality. Thus, the Nordic Swan Ecolabel contributes to the phasing out of substances that are harmful to health and the environment. This helps to prevent both users and factory workers from being exposed to harmful chemicals – and to reduce contamination of air, water and soil.

- There are requirements for **recycled** materials in packaging and instructions on the labels to **reduce waste generation**. This supports circular economy.

- A focus on increased use of raw materials that are both sustainable and renewable, such as bio-based feedstock, monomers and binders, contributes to **sustainable management and efficient use of natural resources**.

Nordic Swan Ecolabelled paints and varnishes contribute to other goals than 12 as follows:

Reduces the use of substances that are hazardous to health and the environment

- Strict requirements on chemicals
- Limits on indoor emissions improve indoor air quality

Limits emissions of hazardous chemicals and contributes to better water quality

- Strict requirements on chemicals

Requires efficient use of resources and reduces greenhouse gas emissions

- Production of titanium dioxide pigments focuses on energy savings and energy efficiency
- Production of cement and/or hydraulic binders focuses on CO_2-reduction

Prevents water pollution

- Strict requirements on chemicals reduces the release of harmful substances to the environment.

Protects biodiversity on land

- Strict requirements on chemicals reduces the release of harmful substances to the environment.

2.3 Microplastics and paints and varnishes

Paint consists of 37% of synthetic polymers on average.[15] In general, waterborne acrylic and vinyl acetate/ethylene paints are dominant because they are inexpensive, they are easy to use, they fit all surfaces, are available in many colors and are very durable and protective for a long time.

Microplastics can be divided into primary and secondary microplastics. Certain paint products contain microspheres, i.e., microbeads or microfibers, to enhance their properties. Water-based paints additionally contain a potentially much larger source of primary microplastics including dispersed polymer particles. They act as a binder in cured paint layers, but remain primary microplastics when paints are disposed inadequately, for example when fluid is poured down the drain. The dissolved polymers in solvent-based paints are, however, not considered microplastics as they are not solid polymer particles. Secondary microplastics are formed by the fragmentation of macroplastics (>5 mm) by processes such as weathering of plastic litter and paint layers. Secondary microplastics consist of the entire paint matrix, including the binder polymers.

Microplastic can be harmful to health and the environment. Microplastics may pose acute and (sub) chronic toxicity, carcinogenicity, and developmental toxicity[16].

Estimates of the different sources vary. According to a recent report from EA-Environmental Action, paint is the sector with the largest emissions of microplastic to ocean and waterways, larger than tyres and textiles.[14] The report concludes that while the leakage from architectural, automotive, and industrial wood paints, is mostly distributed to land, 90% of the leakage from marine paint is distributed to ocean and waterways. For the general industrial and road markings sectors, the split is roughly 50-50. In terms of absolute leakage, a large fraction of leakage occurs in lower income countries in the Asia Pacific region (54% of total leakage), with the second largest contributor being lower income countries from the Middle East and Africa region (12%). Its high leakage rate is mostly linked to mismanagement of waste.[14]

The sources of plastic leakage are multiple but result mainly from two mechanisms: the leakage of macroplastics primarily stemming from mismanaged waste[17] and the leakage of primary microplastics, predominantly originating from abrasion mechanisms as well as voluntary/involuntary spills.

15 Paruta P, Pucino M, Boucher J (2022) Plastic Paints the Environment. EA-Environmental Action. https://www.e-a.earth/plasticpaintstheenvironment
16 Yuan Z et al. (2022) Human health concerns regarding microplastics in the aquatic environment - From marine to food systems Science of The Total Environment, Volume 823, 1 June 2022 https://www.sciencedirect.com/science/article/pii/S0048969722008221
17 Jambeck, J R, (2015) Plastic waste inputs from land into the ocean. Science, 347(6223), 768-771.

The Nordic Swan Ecolabel takes concerns about microplastics seriously and wants to limit emissions of microplastics from products when possible.

Banning the use of synthetic polymers in Nordic Swan Ecolabelled paint and varnishes will mean that the Nordic Swan Ecolabel is not relevant for large parts of the market. There are still only a few paint products available without synthetic polymers. These are not (yet) suitable for all paint applications.[18] The Nordic Ecolabel believes that it has a greater environmental effect to set requirements that can contribute to the paint on the market having less impact on the environment. Here, the overall requirements for chemicals, resource use and climate impact are important. Synthetic polymers increase the service life and durability of the paint. Nordic Ecolabel does not want to reduce these qualities.

Nordic Ecolabel suggests including information on recommended use on the paint can, such as specifying the amount of paint to be used, measures to prevent spillage and how to prevent spillage when washing of equipment after use. This will probably reduce the amount of paint used, spills during use and emissions from washing brushes/rolls.

3 Other labels

EU Ecolabel

The EU Ecolabel is a voluntary ecolabel which is supported by all Member States of the EU. The Nordic Ecolabel and the EU Ecolabel now have the same product types in their respective criteria. As opposed to the previous generation of Nordic Ecolabel paints, where the criteria for outdoor paints and varnishes were in Nordic Ecolabel Chemical building products.

Asthma and Allergy Associations

In Sweden[19], Norway[20], Denmark[21] and Finland[22] the respective Asthma and Allergy Associations offer a label for products that meet their criteria, with a focus on asthma and allergies. When it comes to paints, their criteria focus on emissions (e.g., after 4 days, but it may vary from country to country).

Environmental Product Declarations

Environmental product declarations (EPDs) give detailed environmental information without setting specific requirements for the products. The benefit of the declarations depends entirely on the purchaser's knowledge of the environmental conditions surrounding the product they are buying. At this moment there are several national systems for environmental product declarations, which all are based on the same main standard for EPD, EN 15804. There is no international system for environmental product declarations yet, but work on this is underway. In order to create an environmental product

18 Faber et al. (2021) Paints and microplastics Exploring recent developments to minimise the use and release of microplastics in the Dutch paint value chain. RIVM report 2021-0037
19 Astma och Allergiförbundet Sverige: www.astmaallegiforbundet.se (visited 2022-05-18)
20 Norges Astma- og Allergiforbund: www.naaf.no (visited 2022-05-18)
21 Astma-allergi Forbundet DK: www.astma-allergi.dk (visited 2022-05-18)
22 Allergia-ja Astmaliitto (Fi): www.allergia.fi (visited 2022-05-18)

declaration, relevant product category rules must first be drawn up/agreed. Although EPDs are quite common within the construction industry generally, a search for EPDs on the website where all issued EPDs are listed (www.environdec.com) shows that EPDs are not as common for indoor paints[23].

Der Blaue Engel/The Blue Angel

The Blue Angel[24] is an ecolabel owned by The Federal Ministry for the Environment, Nature Conservation, Building and Nuclear Safety in Germany. Amongst products that can be awarded with The Blue Angel is low-emission interior wall paints and low-emission and low-pollutant varnishes.

4 Justification of the requirements

This chapter presents new and revised requirements, explains the background to them, the chosen requirement levels and any changes compared with previous generation for indoor paints and varnishes and chemical building products (outdoor and industrial paints and varnishes). The appendices referred to are those that appear in the criteria document.

4.1 Definition of the product group

For the purpose of this product document and any extensions of the product group, the definition of indoor and outdoor paints and varnishes and what can be Nordic Swan Ecolabelled is defined by:

- Paints and varnishes which, for decorative, functional, and protective purposes, are applied to buildings, their decorations and furnishings as well as associated structures and are intended for use by consumers and professionals. The product should belong to one of the subcategories (see table 1) found in Annex I of Directive 2004/42/EC[25] ("the paint directive").
- Paints that have been tinted by the distributor at the request of consumers or professional decorators and tinting systems, as well as decorative paints and varnishes in liquid, paste or powder formulas which may have been pre-conditioned or prepared by the manufacturer to meet consumer's needs.

  In addition, the following categories are within the scope of the criteria:

- Industrial paints and varnishes used and manufactured for industrial applications, for example painting furniture/panels for indoor and outdoor use.
- Anti-corrosion paint for industry and infrastructure.
- Wood oils (film forming and non-film forming).

The product group shall <u>not</u> comprise of the following products:

- Anti-fouling coatings

23 The International EPD® System: https://www.environdec.com/library (visited 2022-05-18)
24 The Blue Angel: https://www.blauer-engel.de/en/certification/basic-award-criteria (visited: 2022-05-18)
25 Directive 2004/42/CE https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex%3A32004L0042

- Preservation products for wood impregnation (PT-8 of BPR, Regulation (EU) 528/2012)
- Paints primarily intended for vehicles
- Fillers as defined by EN ISO 4618
- Road-marking paints

Table 1 Appendix I Directive 2004/42/CE

	Product classification, cf. 2004/42/EC
a	Matt coatings for interior walls and ceilings (Gloss < 25@60°)
b	Glossy coatings for interior walls and ceilings (Gloss > 25@60°)
c	Coatings for Exterior walls of mineral substrate
d	Interior/Exterior trim and cladding paints for wood and metal including undercoats
e	Interior trim varnishes and woodstains, including opaque woodstains
	Exterior trim varnishes and woodstains, including opaque woodstains
f	Interior and exterior minimal build woodstains
g	Primers
h	Binding primers
i	One-pack performance coatings
j	Two-pack reactive performance coatings for specific end use such as floors
l	Decorative effect coatings

Nordic Ecolabelling can after making an assessment on request, include other types of products to be included in the criteria.

4.2 Definitions

For the purpose of this document, the following definitions shall apply, partly from EN ISO 4618 and partly from article 2 in the EU-Ecolabel(2014/312/EU)[26].

Table 2

Definition	**Description**
Paint	Pigmented coating material, supplied in a liquid, paste or powder form, which, when applied to a substrate, forms an opaque dried film having protective, decorative or specific technical properties and after application dries to a solid, adherent, and protective coating.
Varnish	Coating material which when applied to a substrate forms a solid transparent film having protective, decorative or specific technical properties.
Ingoing substances	All substances in the Nordic Swan Ecolabelled product regardless of amount, including additives (e.g., preservatives and stabilizers) 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.

26 https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A32021D1871&qid=1665411241922

Impurities	Residuals, pollutants, contaminants etc. from production, incl. production of raw materials, that remain in the Nordic Swan Ecolabelled product in concentrations less than 100 ppm (0.0100%). Impurities in the raw materials exceeding concentrations of 10 000 ppm (1.0000%) are always regarded as ingoing substances, regardless of the concentration in the Nordic Swan Ecolabelled product. Examples of impurities are residues of the following: residues or reagents incl. residues of monomers, catalysts, by-products, scavengers, and detergents for production equipment and carry-over from other or previous production lines. The impurity limit of 100 ppm (0.0100%) applies to each individual substance that is excluded, i.e., Impurities with the same classification in different raw materials shall not be summed up to comply with the limit. The same contaminants in different raw materials also do not need to be summed.
Wood preservative	Product containing a biocide with primary purpose intended to inhibit the development of wood-destroying and/or wood-staining organisms in the wood to which it is applied.
Wood stain	Penetrating composition containing a dyestuff that changes the colour of a wood surface, usually transparent and leaving no surface film, the solvent which may be oil, denaturized alcohol, or water.
Lasure	Coating material, solvent- or water-based, containing small amounts of a suitable pigment and/or extender and used to form a transparent or semi-transparent film for decoration and/or protection of the substrate.
Powder coating	Coating material in powder form which, after fusing and possibly curing, gives a continuous film.
Tinting system	Method for preparing coloured paints by mixing a base with coloured tints.
Masonry coating	Coating material that produces a decorative and protective film for use on concrete, paintable brickwork, blockwork, rendering, calcium silicate board or fibre-reinforced cement.
Binding primers	Coating designed to stabilise loose substrate particles or impact hydrophobic properties.
UV curable paint system	Hardening of coating material by exposure to artificial ultra-violet radiation.
Alkyd resin (binder)	Synthetic resin resulting from the polycondensation of fatty acids (or oils) and carbonic acids with polyols.
Acrylic resin (binder)	Synthetic resin resulting from the polymerization or copolymerization of acrylic and/or methacrylic monomers, frequently together with other monomers.
Hydraulic binder	Materials that that hardens when mixed with water by means of hydration reactions.
Anti-foaming agent	Additive that prevents foaming or reduces the foaming tendency of a coating material.
Anti-skinning agent	Additive that is added to the coating material to prevent skinning during production or storage of the coating material.
Preservative / Biocide	Additive added to a coating material to prevent organisms responsible for microbiological degradation from attacking a substrate, a coating material, or a film thereof.

In-can preservatives	Biocide used to prevent growth of microorganisms during storage of a water-based coating material or stock solution. Active substances within the meaning of Article 3(1)(c) of Regulation (EU) No 528/2012 of the European Parliament and of the Council (the "Biocide Regulation"), intended for use in Product Type 6 (PT 6) as described in Annex V to that Regulation.
Dry-film preservatives	Products used for the preservation of films or coatings by the control of microbial deterioration or algal growth in order to protect the initial properties of the surface of materials or objects. Active substances within the meaning of Article 3(1)(c) of Regulation (EU) No 528/2012 (the "Biocide Regulation"), intended for use in Product Type 7 (PT 7) as described in Annex V to that Regulation
Phthalates	Esters of phthalic acid orthophthalic acid / phthalic acid /1,2- benzene dicarboxylic acid).
White and light coloured	Paints are those with a tri-stimulus (Y-value) > 70%.
Gloss paints	Are those which at an angle of incidence of 60° show a reflectance of ≥ 60.
Mid sheen paints	(Also referred to as semi-gloss, satin, semi matt) are those which at an angle of incidence of 60° or at 85° show a reflectance of < 60 and ≥ 10.
Matt paints	Are those which at an angle of incidence of 85° show a reflectance of < 10.
Dead matt paints	Are those which at an angle of incidence of 85° show a reflectance of < 5.
Transparent	And 'semi-transparent' means a film with a contrast ratio of < 98% at 120µ wet film thickness.
Opaque	Means a film with a contrast ratio of > 98% at 120µ wet film thickness.
Spreading rate	Surface area that can be covered by a given quantity of coating material to give a dried film of requisite thickness.
Blistering	Convex deformation in a film, arising from local detachment of one or more of the constituent coats.
Cracking	Rupturing of a dry film or coat.
Chalking	Appearance of a loosely adherent powder on the surface of a film or coat arising from the degradation of one or more of its constituents.
Flaking	Detachment of small parts of a coating due to loss of adhesion.
Nanomaterial	Nanomaterials/-particles are defined according to the EU Commission Recommendation on the Definition of Nanomaterial (2022/C 229/01): '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. In the determination of the particle number-based size distribution, particles with at least two

	orthogonal external dimensions larger than 100 µm need not be considered. However, a material with a specific surface area by volume of < 6 m^2/cm^3 shall not be considered a nanomaterial.
Volatile organic compound (VOC)	Any organic compound having an initial boiling point less than or equal to 250°C measured at a standard pressure of 101,3 kPa as defined in Directive 2004/42/EC and which, in a capillary column, are eluting up to and including n-Tetradecane ($C_{14}H_{30}$).
Semi volatile organic compound (SVOC)	Any organic compound having a boiling point greater than 250 °C and less than 370 °C measured at a standard pressure of 101,3 kPa and which, in a capillary column are eluting with a retention range after n-Tetradecane (C14H30) and up to and including n-Docosane ($C_{22}H_{46}$).
The paints directive	European Parliament and Council Directive 2004/42/EC.
Level of traceability:	
Identity preserved	Certified product(s) from a certified site is kept separate from other sources throughout supply chain.
Segregated	Certified product from different certified sources is kept physically separate from non-certified product through each stage of the supply chain.
Mass balance	Certified physical product is not separated from and may be mixed with non-certified physical product at any stage in the production process, provided that the quantities are controlled.
Book & Claim	Certified products are completely decoupled from sustainability data.

4.3 General requirements

O1 Information about the product

The applicant must give detailed information on the product to which the application relates. The following information is required:

- Describe the product and its application method with subcategory denotation according to Directive 2004/42/EC or the relevant description from section 4.1 Definitions of the product group.
- If the product forms part of a component system that jointly ensures the functioning of the product, the entire product must be Nordic Swan Ecolabelled and not simply parts of it (e.g., a tinting system comprising a base and coloured tints or two-component varnishes comprising a base and a hardener). The requirement thus refers to the individual product and not to products in the same range (a range is here e.g., systems for exterior painting comprising primer, undercoat, and paint).
- Formulation detailing complete composition with a specification of all ingoing substances (see definition of raw materials and ingoing substances in Chapter 4.2). The description must include:
    - The trade name of each raw material
    - The function of each raw material in the final product
    - The chemical name and CAS no. (if possible) of the ingoing substances
    - Content in % per ingoing substance in the product
    - Specification for preservatives, e.g., "in-can" (PT 6) or preservative for dry-film coatings (PT 7)

- Type of binder

☒ Description of the product in accordance with the definition of what may be Nordic Swan Ecolabelled, e.g., label and product data sheet (if available).

☒ Description of how the product is to be used to achieve functionality (e.g., as a single component, tinting system or multi-component system) and which application method it is intended for.

☒ Formulation detailing complete composition with a specification of all raw materials and ingoing substances, as set out in Appendix 3.

☒ Safety data sheets for each raw material in line with prevailing European legislation (Annex II to REACH Regulation, 1907/2006/EC).

Background to requirement O1

The purpose of this requirement is to give an overview of the paint that is to be certified with the Nordic Swan Ecolabel and that the product falls within the product definition. In cases of a tinting system comprising a base and coloured tints, both the base and the coloured tints must fulfil the requirements as the base is only functional with the coloured tints.

4.4 Chemical requirements

The requirements in the criteria document and accompanying appendices apply to all ingoing substances in the Nordic Swan Ecolabelled product. Impurities are not regarded as ingoing substances and are exempt from the requirements. Ingoing substances and impurities are defined in chapter 4.2 Definitions, unless stated otherwise in the requirements.

O2 Classification of the product

The final product must not be classified and labelled according to Table 3. Note that the responsibility for correct classification lies with the manufacturer.

Table 3 Classification of chemical products CLP Regulation 1272/2008

Classification	Hazard class and category	Hazard code
Hazardous to the aquatic environment	Aquatic Acute 1 Aquatic Chronic 1 Aquatic Chronic 2 Aquatic Chronic 3 Aquatic Chronic 4	H400 H410 H411 H412 H413
Hazardous to the ozone layer	Ozone	H420
Acute toxicity	Acute Tox. 1 or 2 Acute Tox. 1 or 2 Acute Tox. 1 or 2 Acute Tox. 3 Acute Tox. 3 Acute Tox. 3 Acute Tox. 4 Acute Tox. 4 Acute Tox. 4	H300 H310 H330 H301 H311 H331 H302 H312 H332
Specific target organ toxicity: single or repeated exposure	STOT SE 1 or 2 STOT SE 1 or 2 STOT RE 1 or 2 STOT RE 1 or 2	H370 H371 H372 H373

Classification	Hazard class and category	Hazard code
Skin corrosion/irritation	Skin Corr. 1A, 1B or 1C	H314
Aspiration hazard	Asp. Tox. 1	H304
Skin sensitisation	Skin Sens. 1, 1A or 1B	H317
Respiratory sensitisation	Resp. Sens. 1, 1A or 1B	H334
Carcinogenicity*	Carc. 1A or 1B Carc. 2	H350 H351
Germ cell mutagenicity*	Muta. 1A or 1B Muta. 2	H340 H341
Reproductive toxicity*	Repr. 1A or 1B Repr. 2 Lact.	H360 H361 H362
Endocrine disruption for human health**	ED HH 1 ED HH 2	EUH380 EUH381
Endocrine disruption for the environment**	ED ENV 1 ED ENV 2	EUH430 EUH431
Persistent, Bioaccumulative and Toxic properties** Very Persistent, Very Bioaccumulative properties**	PBT vPvB	EUH440 EUH441
Persistent, Mobile and Toxic properties*** Very Persistent, Very Mobile properties***	PMT vPvM	EUH450 EUH451
Explosives	Unst. Expl. Expl. 1.1 Expl. 1.2 Expl. 1.3 Expl. 1.4 Expl. 1.5 Expl. 1.6	H200 H201 H202 H203 H204 H205 H206
Oxidizing liquids and solids	Ox. Liq. 1 to 3 Ox. Sol. 1 to 3	H271 H272
Organic peroxides and self-reactive substances and mixtures	Org. Perox. A to EF Org. Perox. A to EF Org. Perox. A to EF	H240 H241 H242
Extremely flammable aerosol and liquids	Aerosol 1 Flam. Liq. 1	H222 H224

** The classifications concern all classification variants. For example, H350 also covers classification H350i.*

*** See also O12 for additional criteria for potential or identified endocrine disruptors and PBT/vPvB substances.*

Exemptions:

- Outdoor paints and varnishes and industrial paints and varnishes with classification H317 if the classification depends on the content of preservatives approved in PT 7 of Regulation (EU) No. 528/2012.
- Outdoor paints and varnishes, industrial paints and varnishes and outdoor wood oils with classification H412 if the classification depends on the content of preservatives approved in PT 6 and PT 7.
- Anti-corrosion paints for industry and infrastructure with classifications H400, H410 and H411 if the classification is due to zinc and zinc compounds.

✉ Safety data sheet in accordance with Annex II of REACH (Regulation 1907/2006) for each product in the application.

Background to requirement O2

Nordic Ecolabelling strives to ensure that the health and environmental impact of the products are as low as possible. The requirements therefore make it clear that products classified as harmful, very toxic, toxic, harmful to health, corrosive, sensitizing, carcinogenic, mutagenic, toxic for reproduction, explosive, oxidising, and/or highly flammable cannot be ecolabelled. The criteria have however a few exemptions to allow some type of substances which results in product classification that goes against the criteria. It has been deemed necessary to exempt these due to the significant advantage they give to the product shelf-life and lifetime, therefore increasing the quality of the finished coating and resulting in a lower environmental impact. This is due to savings gained from not having to extract new raw materials and produce new products, and the effect relates to the entire life cycle.

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.

Exempting anti-corrosion paints from environmental hazardous classifications contradicts Nordic Ecolabelling policy. However, it can be justified due to the requirement of zinc content in these paints by large commissioners like national transport agencies, hydropower, and offshore industries. Zinc in the paint provides a durable coating and reduces corrosion on steel without being toxic to humans but can harm aquatic organisms. Anti-corrosion paints leach less zinc than hot dip galvanized steel.

An example is zinc silicate paints which provides a slower leaching if the zinc pigment has been passivated by chemically bounding to the silicate. Zinc in the form of zinc silicate has a relatively low solubility, which can reduce zinc leakage in environments with high corrosivity. Traditional epoxy and polyurethane anti-corrosion paints contain less zinc, since the zinc in this type of paint is also encapsulated by topcoats, and they also probably leak less zinc compared to zinc-plated steel. However, these types of paints involve risks related to CMR-classified substances, such as volatile aromatic hydrocarbons (VAH) and allergens. Traditional anti-corrosion paints also have an impact on the environment in the form of leaching of other toxic substances, leeching of microplastics to the marine environment and emissions of volatile organic compounds (VOC) and formation of ground-level ozone. Although zinc leaching occurs from these anti-corrosion paints, it is a better alternative from a life cycle perspective to exempt zinc than to allow VOC, VAH, allergens, and CMR-substances. Furthermore, resources are saved by using products with a long durability, which results in the repainting periods being in longer intervals and the consumption of resources and the risks of use are reduced.

O3 Classification of ingoing substances

The final product must not contain ingoing substances that are classified according to the Table 4.

Table 4 Classification of ingoing substances CLP Regulation 1272/2008

Classification	Hazard class and category	Hazard code
Carcinogenicity*	Carc. 1A or 1B Carc. 2	H350 H351
Germ cell mutagenicity*	Muta. 1A or 1B Muta. 2	H340 H341
Reproductive toxicity*	Repr. 1A or 1B Repr. 2 Lact.	H360 H361 H362
Respiratory sensitisation	Resp. Sens. 1, 1A or 1B	H334
Specific target organ toxicity: single exposure or repeated exposure	STOT SE 1 STOT RE 1	H370 H372
Endocrine disruption for human health**	ED HH 1 ED HH 2	EUH380 EUH381
Endocrine disruption for the environment**	ED ENV 1 ED ENV 2	EUH430 EUH431
Persistent, Bioaccumulative and Toxic properties** Very Persistent, Very Bioaccumulative properties**	PBT vPvB	EUH440 EUH441
Persistent, Mobile and Toxic properties Very Persistent, Very Mobile properties	PMT vPvM	EUH450 EUH451

** The classifications concern all classification variants. For example, H350 also covers classification H350i.*

*** See also O12 for additional criteria for potential or identified endocrine disruptors and PBT/vPvB substances.*

Exemptions:

- Preservatives classified as H370 and H372.
- Respirable crystalline silica/quartz classified as H372/H350i with a maximum content of 1% in raw materials, see separate requirement O10.
- Glyoxal (CAS no. 107-22-2) if the pH in the final product is above 7.5.
- Trimethylolpropane (TMP) (CAS no. 77-99-6), maximum content of 1% in pigments. Time-limited exemption valid until 2027-05-31.
- Bisphenol A (CAS no. 80-05-7) up to 5 ppm in the final epoxy paint.
- If the classification is due to monomers in polymers, please see requirement O7.

✉ Declaration in line with Appendix 1 from the manufacturer of the product and Appendix 2 from the manufacturer of each raw material. Documentation of exemptions for each substance is done in Appendix 1 and 2, together with a statement as to why the substance is present in the product/raw material and other documentation if appropriate.

✉ Safety data sheet for all raw materials in line with Annex II to REACH (Regulation (EC) No 1907/2006).

Background to requirement O3

For the same reasons described under requirement O2, there is a requirement that none of the ingoing substances are classified as carcinogenic, mutagenic, or toxic for reproduction as these have inherently dangerous properties. Same reasoning applies regarding exemptions of a few substances as O2 which are deemed necessary to improve the quality and lifetime of the product, which in overall would result in lower exposure as repainting periods are reduced.

Respirable crystalline silica/quartz is a common impurity found in most mineral fillers, causing the final product to exceed the 100 ppm impurity limit. Silica is classified as STOT RE 1 (H372) and H350i. However, when mixed into wet paint or dry paint film, it is no longer respirable nor poses a health risk. An exemption is made for respirable silica less than 1% in raw materials. To fulfil requirement O10, producers must take measures to limit dust in production.

O4 Environmentally harmful substances

Ingoing substances classified as environmentally harmful with hazard phrases H410, H411 and/or H412, according to CLP Regulation (1272/2008), are limited in the product according to the following formulas.

Indoor wall and ceiling paints:

M*100*H410 + 10*H411 + H412 ≤ 6%

All other products:

M*100*H410 + 10*H411 + H412 ≤ 8%

Where M is the multiplying factor for H410 as stated in CLP.

H410 is the concentration of substances classified with H410 in percent

H411 is the concentration of substances classified with H411 in percent

H412 is the concentration of substances classified with H412 in percent

If information about a substance's harmfulness to the environment (in the form of data concerning toxicity and degradability or toxicity and bioaccumulation) is not available, the substance is treated as environmentally harmful – H410, and multiplication factor 100.

For tinting systems, a worst-case calculation is done with the colour with most tinting paste and the base paint with most environmentally hazardous substances.

Exemptions:

- Preservatives are exempted from the requirement, however, requirement O2 and O5 must still be fulfilled.
- Zinc oxide (CAS no. 1314-13-2) is exempted up to 2500 ppm (0.25%) in the final product. If the product contains 0.5% Zinc oxide, then 0.25% must be included in the calculation.
- Zinc and zinc compounds in anti-corrosion paints for industry and infrastructure.

✉ Declaration in line with Appendix 1 from the manufacturer of the product and Appendix 2 from the manufacturer of each raw material.

✉ Safety data sheet for all constituent substances in line with Annex II to REACH (Regulation (EC) No 1907/2006).

✉ Calculation clearly showing that the requirement is fulfilled.

Background to requirement O4

Environmentally harmful substances that are classified as toxic to aquatic organisms are restricted and can only appear in small quantities. The purpose of restricting these substances is to reduce the ability for such substances to be emitted to water by incorrectly rinsing equipment, e.g., when washing brushes and tools. Preservatives are however exempted from the requirement because they are limited in O5.

The limit for environmental hazardous substances has been lowered and for indoor, outdoor, and industrial paints and varnishes based on licensing data of previous versions.

Zinc oxide (ZnO) is a multifunctional substance used in paint formulations, such as UV-blocker, opacity brightener or to inhibit the growth of microorganisms such as bacteria and fungi, which can spoil the paint. Without ZnO, the lifetime and shelf life of the paint would be reduced. Preservative-free paint formulations rely on other strategies such as pH and moisture control, and careful selection of raw materials, but ZnO can also prevent microbial growth. This reduces the need for additional preservatives, which may have negative environmental impacts. The use of ZnO as an antimicrobial agent in paint can help to extend the shelf life of the paint and reduce the need for other preservatives.

Zinc and zinc compounds for anti-corrosion paint for industry and infrastructure is exempted from the requirement because zinc is necessary in order to achieve anti-corrosion properties. Additionally, zinc leeching to the environment is significantly reduced due to zinc being inhibited by silicate in e.g., two-component zinc silicate coatings compared to traditional galvanised steel and steel coated with thermally sprayed zinc. As only professionals are allowed to use the products, the risk of incorrect handling is minimal. Furthermore, if using two-component products, left-over zinc is recycled and there is minimal spill.

O5 Preservatives

Only preservatives compliant with product-type 6 and product-type 7 according to Regulation (EU)528/2012 (The Biocidal Products Regulation) can be used.

The amount of preservative/combination of preservatives is limited in the final product including tinting paste according to the tables 5 and 6. See also limitations in requirements O2 and O3. The amount of preservatives must not exceed the maximum theoretical amount at the time of the production.

For tinting systems, a worst-case calculation or analysis must be performed for the colour with most tinting paste and the base paint with highest content of preservative and isothiazolinone compounds.

Note that Dithio-2,2'-bis-benzmethylamide (DTBMA, CAS no. 2527-58-4) is to be included in the total amount of isothiazolinones.

Note that 2-cyanoacetamide (DBNPA, CAS no. 10222-01-2) is to be excluded from the calculation of total preservatives.

The amount of preservatives may be reported in one of the following ways:

- The maximum theoretical amount of preservative must not exceed the limit values in Table 5 at the time of manufacturing. The limit value is stated in the tables below and the amount must be calculated based on added preservatives and the maximum amount in the raw materials.

  or

- Alternatively, the amount of preservatives can be measured analytically by high-performance liquid chromatography (HPLC) or similar methods and shall be based on the maximum amount in the final paint. The measurement is made on the finished product before it is sealed or the constituent raw materials that contain biocides.

Table 5 Concentration limits for preservatives in indoor paints and varnishes in the final product.

Product type	Isothiazolinones***	Preservatives total
Indoor paints and varnishes*	500 ppm (0.0500%)	900 ppm (0.0900%)
Wet room paints*)**	500 ppm (0.0500%)	1600 ppm (0.1600%)

* *Paints, varnishes, base paints with tinting paste etc.*

***Indoor paints intended for use in areas with high humidity, including kitchens and bathrooms.*

*** *All PT 6 isothiazolinones with a specific concentration limit (SCL) of 15 ppm or 360 ppm are limited to 15 ppm or 360 ppm each in the final product (each CLP Appendix VI entry calculated separately).*

If the SCL is changed in accordance with CLP Regulation 1272/2008 Annex VI for other PT 6 isothiazolinones, they and their limit values will also be changed and added accordingly.

Table 6 Concentration limits for preservatives in indoor/outdoor industrial paints and varnishes and outdoor paints and varnishes.

Product type	Isothiazolinones*	Preservatives total
Indoor industrial paint and varnish, incl. wood oils	500 ppm (0.0500%)	1500 ppm (0.1500%)
Outdoor industrial paint and varnish, incl. wood oils	1500 ppm (0.1500%)	5000 ppm (0.5000%)
Outdoor paint and varnish	1500 ppm (0.1500%)	5000 ppm (0.5000%)
Anti-corrosion paint for industry and infrastructure	100 ppm (0.0100%)	200 ppm (0.0200%)

* *All PT 6 isothiazolinones with a SCL of 15 ppm or 360 ppm are limited to 15 ppm or 360 ppm each in the final product (each CLP Appendix VI entry calculated separately).*

If the SCL is changed in accordance with CLP Regulation 1272/2008 Annex VI for other PT-6 isothiazolinones, they and their limit values will also be changed and added accordingly.

✉ Declaration in line with Appendix 1 from the manufacturer of the product and Appendix 2 from the manufacturer of each raw material.

✉ Test report of results from analysis by HPLC or similar method showing that the requirement concerning preservatives is fulfilled.

✉ Documentation showing that the test laboratory fulfils the requirement in Appendix 4.

✉ Calculation clearly showing that the requirement concerning preservatives is fulfilled.

Background to requirement O5

Preservatives are added to liquid products to prevent bacterial growth in the product (in-can) or on the surface of materials or objects(dry-film preservative).

Paints and varnishes have a long shelf life at the store and at the consumer. Preservatives are needed in paint and varnishes because e.g., filling raw materials may have contaminants that can result in microbial growth and deterioration of the products.

Painting exterior wood is of great importance considering the large scale of wooden house buildings and wooden structures in the Nordic region. When moisture penetrates the wood, microorganisms such as algae and mould form and the wood quickly become black-spotted from growth. Effective protection in the form of film preservation is essential. Without film preservation, the protection provided by the covering paint layer weakens, giving rise to mould and algae attack, and the wood becomes ugly and eventually weakens. The consequence is that the repainting periods come in shorter intervals, consumers/professionals buy more paint and the material and resource consumption to produce the outdoor paints increases. In addition, the use of algae detergents is increasing, as is the replacement of wood.

The limit for preservatives for outdoor paints and varnishes and industrial paints has been lowered compared to the previous version based on licensing data. Furthermore, all isothiazolinones for product type 6 (PT 6) that has a specific concentration limit (SCL) of 15 ppm will always be limited to 15 ppm in the final product. The SCL of 15 ppm for isothiazolinones for PT 6 is based on their potential to cause skin sensitization and the SCL ensures that the concentration in the final product is low enough to minimize the risk of sensitization and protect consumers from potential health hazards.

Nordic Ecolabelling allows the use of encapsulated biocides. However, there are no special provisions in the CLP regulation nor in the European Chemicals Agency (ECHA's) Guidance that apply specifically to encapsulated substances. A reasonable interpretation is that there is no support in the CLP regulation to classify only on the free content of the substance in the case of an encapsulated substance. Hence the substance should be considered as biologically available since the substance is intended to be emitted. As a consequence of the lack of guidance, Nordic Ecolabel allows the use of encapsulated biocides, however they are to be evaluated based on total preservatives until more specific information is available for manufacturers of biocides, as well as importers and downstream users / formulators. Thus, it is not permitted to calculate only on the released amount of preservatives.

O6 Formaldehyde

Indoor paints and varnishes:

- The level of free formaldehyde in the final product must not exceed 25 ppm (0.0025 w%, 25 mg/kg) measured by HPLC, the Merckoquant method or similar methods.
- The emissions of formaldehyde of the final product after 28 days must not exceed 0.06 mg/m^3 measured in the air of a test chamber according to EN 16516.

All other products:

- The level of free formaldehyde in the final product must not exceed 25 ppm (0.0025 w%, 25 mg/kg) measured by HPLC, the Merckoquant method or similar methods.

For tinting systems, the colour with the tinting paste and the base paint predicted to contain the highest theoretical amount of formaldehyde (worst case) shall also be determined and measured.

✉ Declaration in line with Appendix 1 from the manufacturer of the product and Appendix 2 from the manufacturer of each raw material.

✉ Test report according to EN 16516, HPLC, Merckoquant method or other equivalent test method for the products showing that requirement is met.

✉ Documentation showing that the test laboratory fulfils the requirement in Appendix 4.

Background to requirement O6

Formaldehyde is a toxic and allergenic substance that has carcinogenic effects and should therefore be avoided as far as possible.

In this generation of the criteria, the requirement has been updated to separate indoor paints and varnishes from outdoor paints and varnishes and industrial paints.

For indoor paints and varnishes, the focus is on maintaining a good indoor air climate, while staying in compliance with the EU Taxonomy and to protect users from exposure.

For outdoor paints and industrial paints, the requirement is similar as to the previous generation of the criteria.

To minimising the costs to applicants the formaldehyde content or emission shall be determined for the white base or transparent tinting base predicted to contain the highest theoretical amount of formaldehyde. The content of the colour tint which is predicted to contain the highest theoretical amount of formaldehyde (worst case) shall also be determined.

O7 Residual monomers in polymers

For each polymer present in the product >1 w% the quantity of residual monomers* and its classifications must be stated. There cannot be more than 100 ppm (0.0100 w%, 100 mg/kg) of the residual monomer in the polymer of each classification in Table 7.

* *Residual monomers in newly produced polymers and based on the content in the raw material.*

For tinting systems, a worst-case calculation is done with the colour with the most tinting paste and the base paint with most residual monomers.

Table 7 Classification according to CLP Regulation 1272/2008

Classification	Hazard class and category	Hazard code
Carcinogenicity	Carc. 1A or 1B Carc. 2	H350, H350i H351
Mutagenic	Muta. 1A or 1B Muta. 2	H340 H341
Germ cell mutagenicity	Repr. 1A or 1B Repr. 2 Lact.	H360 H361 H362
Respiratory sensitisation	Resp. Sens. 1, 1A or 1B	H334
Specific target organ toxicity: single exposure or repeated exposure	STOT SE 1 or 2 STOT SE 1 or 2 STOT RE 1 or 2 STOT RE 1 or 2	H370 H371 H372 H373

Exemptions:

- Vinyl acetate (CAS no. 108-05-4) as residual monomer in polymers up to 700 ppm.

✉ Declaration in line with Appendix 1 from the manufacturer of the product and Appendix 2 from the manufacturer of each raw material.

✉ If vinyl acetate (CAS no. 108-05-4) is present in an amount over 100 ppm, please also state the amount in ppm in each polymer.

Background to requirement O7

Residual monomers in polymers can cause negative health effects, for example due to the allergic and carcinogenic properties of the monomers. This risk is considered so great that it necessitates a separate requirement to limit the level of residual monomers in the polymer. Monomers tend to reduce over time, as many monomers are volatile compounds. The requirement relates to the newly produced polymer since it is important to reduce the impact at source and to this end it is most practical for the polymer manufacturer to perform the analysis. The limit of 100 ppm of residual monomers in polymers with classification according to Table 7 is based on licensing data.

Vinyl acetate is used in polymer dispersions in paints. In the previous version, the classification of Carc. 2 H351 was relatively new in relation to the publication of the criteria, and a limit of 1000 ppm was exempted as there was not much focus in reducing the monomer in polymers. As a result, it was difficult to obtain polymers containing less than 100 ppm of vinyl acetate. Steps have been taken to reduce vinyl acetate in polymers. However, according to our licensing data, the general limit of 100 ppm is still too strict. Therefore, vinyl acetate is exempt up to 700 ppm.

O8 Heavy metals

The following heavy metals or heavy metal compounds must not be present in the product or in its raw materials. Traces of the following metals from residuals can be included up to 100 ppm (100 mg/kg, 0.0100 w%) per single metal in the raw material.

- Cadmium
- Lead
- Chromium VI

- Mercury
- Arsenic
- Barium
- Selenium
- Antimony

Exemptions:

- Barium sulphate and other equally insoluble barium compounds.
- Antimony in pigments contained in a TiO_2 rutile lattice on the following terms: test results must prove that the molecular structure is inert, and that the environmental and health effects of the pigment are on the same level as, or better than, the results for C.I Pigment Brown 24 CAS no. 68186-90-3 and C.I Pigment Yellow 53 CAS no. 8007-18-9 in the report: UNEF Publications, OECD SIDS Initial Assessment Profile (www.inchem.org).

☒ Declaration in line with Appendix 1 from the manufacturer of the product and Appendix 2 from the manufacturer of each raw material.

☒ For pigment that contains antimony integrated into a TiO_2 rutile lattice, documentation must be submitted to show that the molecular structure is inert, and that the environmental and health effects of the pigment are on the same level as, or better than, the results for C.I Pigment Brown 24 CAS no. 68186-90-3 and C.I Pigment Yellow 53 CAS no. 8007-18-9 in the report: UNEF Publications, OECD SIDS Initial Assessment Profile (www.inchem.org).

☒ For antimony in pigments that are exempted by the above terms, please attach test according to test method DIN 53770-1 or equivalent, showing that terms are fulfilled).

Background requirement to O8

Nordic Ecolabelling restricts heavy metals ("heavy metals" refers in this case to heavy and particularly environmentally harmful metals as specified in the text) because they are toxic to people and other organisms, both on land and in the aquatic environment. On forested land, metals can end up in microorganisms in such way that the degradation of dead organic material and thus the release of nutrients are slowed[27]. On agricultural land, metals can disrupt the organisms in the soil or have a directly toxic effect on plants. Metals on agricultural land can also be taken up by crops to varying degrees, leading to human exposure[28]. Mercury, cadmium, arsenic and lead are toxic to the human nervous system and kidneys, amongst other things, and the metals can accumulate in living organisms[29]. Chromium VI is classified as: very toxic, CMR and harmful to the environment.

27 Government official investigations: https://www.regeringen.se/49bbb3/contentassets/c0f10a5d57534a48b9b8641aba971a1e/bilagorna-6-9 (visited 2022-06-01)

28 Government official investigations: https://www.regeringen.se/49bbb3/contentassets/c0f10a5d57534a48b9b8641aba971a1e/bilagorna-6-9 (visited 2022-06-01)

29 Toxicity, mechanism and health effects of some heavy metals: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4427717/ (visited 2022-06-01)

The metals and their compounds – cadmium, lead, chromium VI, mercury, arsenic, barium (except for barium sulphate, and other equally insoluble barium compounds), selenium and antimony – must therefore not be included in the product or in its ingoing substances. It is, however, accepted that ingoing substances may contain traces of the substances in the form of residuals. Trace amounts of each heavy metal must not exceed 100 ppm in the raw material. This means that the requirement is stricter than the general limit for residuals specified in section "5.4 Chemical requirements". It is relevant to set a stricter requirement to residuals of heavy metals since they are included in the raw materials in paints as sand, gravel etc. The requirement has been set by the Nordic Ecolabel to steer toward natural raw materials with lower amounts of residuals.

The limit value is based on metals in minerals that can be extracted from the material. For mineral raw materials and pigments, bound metals in a crystalline matrix are not of concern as long as they are insoluble and do not exceed the threshold given in the requirement. Therefore, these may be used if laboratory testing e.g., according to DIN 53770-1 or equivalent methods show that the metal is bonded within a crystal lattice and is insoluble.

Barium sulphate (and other equally insoluble barium compounds) is used as fillers in paints and are exempted from this requirement since there are not many other alternatives available with the same function.

Note that selenium is not a metal, but it interacts with many metals and behaves in the same way in the environment and has therefore been included in the requirement. Arsenic is included in the requirement due to its status as a semi-metal.

O9 Titanium dioxide

If the product contains more than 3.0 w% of titanium dioxide (TiO_2) (CAS no. 13463-67-7), the following requirements apply for energy consumption, emissions and residual waste:

- Energy consumption:

Full or pending implementation of an energy management system for the manufacturing plant in accordance with ISO 50001.

- Emissions and residual waste:

Emissions from the production of TiO_2 shall not exceed the values given in Table 8 and 9 for the sulphate process and the chloride process, respectively.[30]

Table 8 Emission limits from the production of TiO_2 using the sulphate process.

Sulphate process	Limit
SOx expressed as SO_2:	7.0 kg/tonne TiO_2
Sulphate waste:	500 kg/tonne TiO_2

30 Derived from the Best Available Techniques for the Production of Basic Inorganic Chemicals (BREF) (August 2007).

Table 9 Emission limits from the production of TiO_2 using the chloride process.

Chloride process	Limit
When using natural ore:	103 kg chloride waste/tonne TiO_2
When using synthetic ore:	179 kg chloride waste/tonne TiO_2
When using slag ore:	329 kg chloride was/tonne TiO_2

If more than one type of ore is used, the values apply proportionately to the ore type used.

- Occupational exposure:

The raw material manufacturer must meet the requirements for powder handling according to O10.

☒ Declaration in line with Appendix 1 from the manufacturer of the product and Appendix 2 from the manufacturer of each raw material.

☒ ISO 50 001 certificate for the manufacturing plant or documentation showing pending implementation.

☒ A description and calculation from the titanium dioxide-manufacturer showing that the requirement for emissions is fulfilled.

Backgroud requirement to O9

Titanium dioxide is a significant contributor to the environmental impact of paint[31], however it is important in enhancing the performance of the paint. A carefully balanced approach is needed in order to ensure that high quality paints are produced, whilst minimising the impact to the environment. It is difficult to steer towards a specific manufacturing process for TiO_2 pigments, as it is heavily reliant on geographical location of the manufacturing plant, local policies and ore supply. This need to be considered to determine the best processing option with the least environmental impact[32].

Both the sulphate and the chloride processes are considered very energy intensive and results in both direct and indirect CO_2 emissions. Direct emissions occur because of the chemical reactions in the processes at the manufacturing plant while indirect emissions are the emissions generated along the energy supply chain up to the point of operation.

Because the production of titanium dioxide is energy intensive, a requirement has been introduced to reduce the energy demand to produce TiO_2-pigments with certified energy management systems and proved energy reduction commitments. By requiring certification of the manufacturing plant in accordance with e.g., ISO 50001, the plant is recognized as working with international climate goals to reduce their energy demand and/or implement energy efficient measures by introducing operational changes, such as those implemented under the ISO 50001 certification.

31 https://ec.europa.eu/environment/eussd/smgp/documents/PEFCR_Decorative%20Paints_Feb%202020.pdf, accessed on 2022-11-09

32 Middlemas et al., (2015) Life cycle assessment comparison of emerging and traditional Titanium dioxide manufacturing processes

The production of titanium dioxide is also associated with emissions of sulphates, SO_2 and chloride[33]. The requirement level has been calculated based on the 38 g TiO_2/m^2 with 98% opacity on a standard reference surface.

Titanium dioxide previously had a harmonized classification as Carc. 2 (H351, suspected of causing cancer by inhalation), which led Nordic Ecolabelling to introduce exemptions in classification of ingoing substances (O3) and handling requirements for powders (O10). On 23 November 2022, the General Court annulled this classification, and on 1 August 2025 the Court of Justice dismissed the Commission's appeal. TiO_2 is therefore no longer harmonized classified as Carc. 2, and the exemption in our criteria is no longer needed, and thus TiO_2 can still be used in the product group.

O10 Powdered raw materials

Raw materials in powder form must be added in a closed system, in a suspension or by means of a method that promotes a "low-dust" working environment e.g., using protective equipment which heavily reduce the dust or completely remove the dust from the raw materials (e.g., exhaust ventilation, personal protective equipment and clear safety instructions).

✉ Description of how powdered raw materials are handled during the production process for paints and varnishes.

Background requirement to O10

It is required that powdered substances be added in a closed system, in a suspension or using a method, e.g., protective equipment that ensures a "low-dust" work environment. The protective equipment/method must significantly reduce or completely remove the dust from the raw materials.
The aim of the requirement is to ensure that the working environment is as dust-free as possible to secure a good working environment for those involved in manufacturing the indoor paint and varnishes.

Respirable crystalline silica/quartz is present as an impurity in most mineral fillers and is therefore commonly used in paints. It is classified as STOT RE 1 (see O3), but when it is mixed into the wet paint it binds to larger particles and is therefore no longer "respirable". To protect the people working in the production the requirement for constituent powdered substances is important for raw materials containing respirable silica, which is in powder.

Compliance with the requirement must include general information on how powdered raw material is dosed, with what types of equipment, if any air extraction system is used and how it is being monitored to determine if the systems are operating and functioning properly, how employees are trained regarding risks of powder handling, protective equipment used and how dust exposure is controlled towards legislation to make sure that the workers are not overly exposed to dust.

O11 Nanomaterials/-particles

Nanomaterials/-particles must not be added or be present in the product.

Nanomaterials/-particles are defined according to the EU Commission Recommendation on the Definition of Nanomaterial (2022/C 229/01):

33 Best Available Techniques for the Production of Basic Inorganic Chemicals (BREF) (August 2007).

'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.

Exemptions:

- Pigments. Please note that Nano-TiO_2 is not considered a pigment.
- Naturally occurring inorganic fillers in accordance with annex V point 7 in REACH.
- Synthetic amorphous silica (SAS). This exemption applies to non-modified SAS. Chemically modified colloidal silica can be included in the products if the silica particles form aggregates in the final product. Any surface treatment of nanoparticles must fulfil requirement O3 (Classification of constituent chemical substances) and requirement O12 (Prohibited substances).
- Unmodified calcium carbonate (grounded calcium carbonate, GCC) and unmodified precipitated calcium carbonate (PCC).
- Polymer dispersions.

✉ Declaration in line with Appendix 1 from the manufacturer of the product and Appendix 2 from the manufacturer of each raw material.

Background requirement to O11

Nanomaterials are a diverse group of materials which are often more reactive and can have altered properties compared to their bulk counterparts. Further, different sizes, shapes, surface modifications and coatings can also change their physical and chemical properties, which complicates the risk assessment. There is concern among regulators, scientists, environmental organisations, and others

about the insufficient scientific knowledge regarding the potential detrimental effects on health and the environment.[34, 35, 36, 37, 38, 39, 40, 41, 42]

Nanomaterials can cause increased or unwanted effects in humans or the environment since nano particles can cross biological membranes and thus be taken up by cells and organs. One of the main concerns are linked to free nanoparticles, as some of these – when inhaled – can reach deep into the lungs, where the uptake into the blood is more likely. Inhalation studies in rats have shown that nanoparticles may induce more irreversible inflammation and result in more tumours than an equal mass of larger particles.[43]

Although concerns about nanomaterials have emerged over the last 30 years, not all nanomaterials are new. Most nanomaterials on the market today have either been in use for decades or are more recently engineered nanoforms of previously existing materials.[44] For example, nanoparticles of carbon black and amorphous silica (SiO_2) have been used for the last century. Titanium dioxide (TiO_2), has long been used as a colourant in the bulk form, but is now manufactured as nanomaterial for other purposes.[45] In the future, other types of engineered nanomaterials are expected to come onto the market.[46]

In the product group of paints and varnishes it is hard to formulate requirements to the content of nano particles. Paints and varnish products consist of many ingoing substances, and it is difficult to keep an overview of all ingoing components and the size distributions of them. Many of the traditional raw materials used in paints and varnishes consists of particles in nano size which are referred to as nano materials according to the EU commission's definition.

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34 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

35 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

36 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.

37 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

38 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

39 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

40 SweNanoSafe. Nationell plattform för nanosäkerhet. https://swenanosafe.se/ (visited 2022-06-07)

41 BEUC – The European Consumer Organisation. Nanotechnology. www.beuc.eu/safety/nanotechnology (visited 2022-06-07)

42 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

43 EU observatory for nanomaterials Risk assessment of nanomaterials – further considerations https://euon.echa.europa.eu/documents/23168237/24095644/nano_in_brief_en.pdf/295c5f46-0f1e-4ad5-72a5-81c44b45bdd5

44 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

45 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

46 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

There are also examples of traditional raw materials containing a small fraction of nanoparticles that are produced with an even larger fraction of ultrafine particles than earlier and that the particles in many cases have a surface treatment. As a starting point, we prohibit new nano materials based on the precautionary principle. Several nano-sized traditional paint raw materials are accepted, as described in the exemptions.

Nano-TiO_2 as a coating on windows has shown that the photocatalytic effect is reduced and that TiO_2 is released from the surface into the environment when subjected to ageing tests (water, salt, UV light)[47]. It is, however, not entirely clear whether it is nano- TiO_2 that is released or larger TiO_2 particles. The study shows that the photocatalytic effect is reduced by ageing without being concluded with what the cause is. Nano-TiO_2 is not considered a pigment, but a new nanomaterial that is added to give the products new properties, such as a self-cleaning effect in paints. These are not exempted from the requirement and therefore must not be used in Nordic Ecolabelled paint and varnishes.

Pigments are exempted from the requirements concerning nanoparticles, since they are necessary in indoor paint and no other suitable replacement is available to fulfil their function.

Synthetic amorphous silica is considered a traditional raw material in paint. Since amorphous silica is a nanomaterial, under the European Commission definition, synthetic amorphous silica is exempted from the requirement concerning nanomaterials.

Ground Calcium Carbonate (GCC) is formed directly from the grinding of limestone to a powder. GCC can be produced using two different processing methods that are dry or wet. Each method produces different finishing products that suit different applications. Precipitated Calcium Carbonate (PCC) is produced chemically and precipitated as a powder. PCC is produced through a carbonation process between fast lime and carbon dioxide. PCC is a synthetic mineral that allows more flexibility in adapting its size, shape, particle size distribution compared to GCC. Therefore, the complexity of processing for PCC is one of the main reasons for a higher production cost compared to GCC. The chemical composition of GCC and PCC is the same. GCC can be seen as naturally occurring. Although PCC is chemically manufactured, there is no indication that unmodified PCC would have a higher toxicity than GCC as it has been evaluated in EU.[48]

Polymer dispersions have also been exempted from the requirement. In the follow up report from the EU Commission[49] to the second "Regulatory Review on Nanomaterials" from 2012[50] it is stated that the solid nanomaterials dispersed in a liquid phase (colloidal) shall be considered as nanomaterials according to the EU Commissions recommendation. Nano emulsions are however not covered by

47 J. Olabarrieta et al, Aging of photocatalytic coatings under a water flow: Long run performance and TiO2 nanoparticles release, Applied Catalysis B: Environmental, Volumes 123–124, 23 July 2012
48 https://efsa.onlinelibrary.wiley.com/doi/10.2903/j.efsa.2022.7135
49 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
50 Communication from the commission to the european parliament, the council and the european economic and social committee, Second Regulatory Review on Nanomaterials, COM(2012) 572 final

the definition. Polymers/monomers can occur in different phases and sizes, and it is therefore chosen to explicitly mention that polymers are exempted from the definition in paint and varnishes.

O12 Prohibited substances

The product must not contain ingoing substances that are:

- Substances on the REACH Candidate list of SVHC.
- Substances evaluated by the EU to be Persistent, Bioaccumulative, and Toxic (PBT) or very Persistent and very Bioaccumulative (vPvB), in accordance with the criteria in Annex XIII of REACH and substances that have not yet been investigated, but which meet these criteria.
- Endocrine disruptors: Substances on the EU member state initiative "Endocrine Disruptor Lists", List I, II and III, see the following links:
    - https://edlists.org/the-ed-lists/list-i-substances-identified-as-endocrine-disruptors-by-the-eu
    - https://edlists.org/the-ed-lists/list-ii-substances-under-eu-investigation-endocrine-disruption

      2,2-dibromo-2-cyanoacetamide (DBNPA, CAS. No 10222-01-2) is exempted from the requirement.

      Butylated hydroxytoluene (BHT, CAS. no 128-37-0) is exempted up to 100 ppm in the final product.

      3-iodo-2-propynyl butylcarbamate (IPBC, CAS no. 55406-53-6) is exempted, however see requirement O5.
    - https://edlists.org/the-ed-lists/list-iii-substances-identified-as-endocrine-disruptors-by-participating-national-authorities

A substance which is transferred to one of the corresponding sublists called "Substances no longer on list", and no longer appears on any of List I-III, is no longer excluded. The exception is those substances on sublist II which were evaluated under a regulation or directive which doesn't have provisions for identifying EDs (e.g., the Cosmetics Regulation, etc.). For those substances, ED properties may still have been confirmed or suspected. Nordic Ecolabelling will evaluate the circumstances case-by-case, based on the background information indicated on sublist II."

- Organotin compounds.
- Phthalates *(*Definition of phthalates: *Esters of phthalic acid orthophthalic acid / phthalic acid /1,2- benzene dicarboxylic acid).*
- 34 bisphenols[51] that have been identified by ECHA for further EU regulatory risk management that are known or potential endocrine disruptors for the environment or for human health, or that can be identified as toxic for reproduction.
- Alkylphenols, alkylphenol ethoxylates (APEO) and other alkylphenol derivates (APD).
- Perfluorinated and polyfluorinated alkyl substances (PFAS).
- Halogenated organic compounds. Exemptions* for:
    - Preservatives that fulfil O5.

51 Assessment of regulatory needs: Bisphenols. ECHA – 16 December 2021: Section 2.1: Bisphenols for which further EU RRM is proposed – restriction https://echa.europa.eu/documents/10162/7de6871f-30db-9cdc-0a13-20942f511e00

  - Paint pigments that meet the EU's requirement concerning colourants in food packaging under Resolution AP (89) point 2.5.
  - Driers in oxidative drying paints, see also O3 regarding classifications.

** Perfluorinated and polyfluorinated alkyl substances are covered by their own bulletin and are not included in this exemption.*

- Isocyanates. Exemption for water-borne polyisocyantates with a chain length of more than 10, where the concentration of isocyanates with a chain length of less than 10 as an impurity is documented.
- Fragrances.

✉ Declaration in line with Appendix 1 from the manufacturer of the product and Appendix 2 from the manufacturer of each raw material.

✉ If halogenated organic pigments are used, a declaration is required from the pigment supplier confirming that the pigment meets the EU's requirement concerning colourants in food packaging under Resolution AP (89) point 2.5.

✉ If water-borne polyisocyanates with a chain length of more than 10, where the concentration of isocyanates with a chain length of less than 10 as an impurity are used, send documentation showing this.

Background requirement to O12

There are several requirements here about substances that the product must not contain. The reason/background for this is stated below in each case:

The Candidate List identifies substances of very high concern which fulfil the criteria in article 57 of the REACH Regulation (EC 1907/2006). The list includes carcinogenic; mutagenic; and reprotoxic substances (CMR, categories 1A and 1B in accordance with the CLP Regulation); and PBT (persistent, bioaccumulative and toxic) and vPvB (very persistent and very bioaccumulative) substances (as defined in REACH Annex XIII). In addition, two more substance groups are included if they are of equivalent level of concern (ELoC) as the ones previously mentioned. These are endocrine disruptors and substances which are environmentally hazardous without fulfilling the requirements for PBT or vPvB. Based on these adverse characteristics, Nordic Ecolabelling prohibits substances on the Candidate List. This means that we take action ahead of the legislation and ban the substances before they are subject to authorisation and restriction in accordance with REACH.

PBT and vPvB are abbreviations for substances that are persistent, bioaccumulative and toxic, and very persistent and very bioaccumulative, respectively, in accordance with REACH Annex XIII. This means that they are not biodegradable and that they accumulate in living organisms. Based on these adverse characteristics they pose a threat to the environment and human health. They are prohibited in all Nordic Swan Ecolabel products.

Endocrine disruptors (EDs) are chemicals that alter the functioning of the endocrine (hormone) system and consequently cause adverse health effects. The term potential EDs is used for chemicals with properties that make them suspected to be EDs. The hormone system regulates many vital processes in living organisms and when normal signalling is disturbed, adverse effects may result. EDs raise high concern for their risk of causing serious negative impact on

the environment as well as on human health specifically. Special concern is raised for effects on reproduction and development and about possible links to increases in public health diseases. While effects in wildlife populations have been confirmed, evidence is pointing to effects also in humans.

Currently, endocrine disrupting properties is not a hazard that is classified according to the CLP regulation. Also, harmonised scientific criteria for the identification of EDs are missing across different pieces of EU legislation. Few EDs have been identified in the legislation so far, compared to the numbers of potential EDs. Under these circumstances, the Nordic Swan Ecolabel excludes identified and potential EDs listed by the EU member state initiative "Endocrine Disruptor Lists" at www.edlists.org. The initiative is a voluntary collaboration, compiling and presenting a single repository of information about the current status of substances identified as EDs or being under ED evaluation in the EU.

A substance listed on any of List I; II; and/or III is excluded in the product group. List I contain substances identified as EDs at EU legislative level; List II contains substances under EU legislative ED evaluation; and List III is for substances considered by a national authority to have ED properties. All listed substances are excluded from all raw materials and products unless otherwise specified in the requirement, meaning that substances listed with reference to e.g., the Cosmetics Regulation are not only excluded from cosmetics.

The requirement concerns the main lists (List I-III) and not the corresponding sublists called "Substances no longer on list". A substance which is transferred to a sublist is thus no longer excluded, unless it also appears on any of the other main lists I-III. However, special attention is needed concerning those List II substances which are evaluated under a regulation or directive which doesn't have provisions for identifying EDs, e.g., the Cosmetics Regulation. Since it's not within the scope of e.g., this regulation to identify EDs, it's not clear how the substances will be handled at www.edlists.org once the evaluation (safety assessment of the substances in cosmetics in this case) is finalised. Nordic Ecolabelling will evaluate the circumstances for substances on sublist II case-by-case, based on the background information indicated on the sublist.

The lists are dynamic, and the companies are responsible for keeping track of updates, in order to keep labelled products compliant with the requirement throughout the validity of the licences. Nordic Ecolabelling acknowledges the challenges associated with new substances being introduced on particularly List II and III, and in some cases also List I. We will evaluate the circumstances and possibly decide on a transition period on a case-by-case basis.

By excluding both identified and prioritised potential EDs which are under evaluation, the Nordic Swan Ecolabel ensures a restrictive policy on EDs. However, in justified cases, certain substances that appear on these Lists or have been moved to "Substances no longer on list" may be exempted when necessary to avoid burden shifts and maintain overall environmental or health benefits.

2,2-dibromo-2-cyanoacetamide (DBNPA): Exempted due to its rapid degradation in the environment, leading to low risk of endocrine-disrupting effects despite its listing. Allowing DBNPA avoids the need to replace it with more persistent or bioaccumulative preservatives, thereby reducing long-term environmental burden.

Butylated hydroxytoluene (BHT): Exempted up to 100 ppm in the final product because it is widely used as an antioxidant stabiliser, and its limited concentration significantly reduces potential exposure and risk. The exemption enables the use of an effective stabilizer that prevents degradation of products during storage, thereby improving shelf life and reducing product waste.

3-iodo-2-propynyl butylcarbamate (IPBC): Exempted due to its essential biocidal function as a preservative and film protector. Its use is regulated through specific concentration limits, ensuring controlled application and minimised exposure. The exemption prevents burden shifts by allowing effective preservation within strict limits, reducing the risk of product degradation, microbial growth, and the need for more hazardous or less efficient alternatives.

Organotin compounds are used as a catalyst that harden through cross-linking. The level of tin catalyst depends on the cross-linking system, and the quantity of silicone or polymer. Organotin compounds were on the Danish Environmental Protection Agency's list of undesirable substances[52], but were subsequently removed since they are used in quantities of less than 100 tonnes per year. They have several inherent properties that are not desirable in Nordic Ecolabelled paints and varnishes products, such as endocrine disrupting and environmentally hazardous, see more below.

Several phthalates are identified as endocrine disruptors and some of them are classified as reprotoxic. For these reasons several phthalates are included in the Candidate list. Based on their hazardous properties phthalates pose a threat to the environment and human health and there is a ban on this group of substances. The exclusion of phthalates covers esters of phthalic acid (orthophthalic acid / phthalic acid /1,2- benzene dicarboxylic acid or commonly known as ortho-phthalates. The exclusion does not cover tera-phthalates or cyclic phthalates.

Several bisphenols with the general bisphenol structure and 'bisphenol derivatives' which have constituents with structural properties common to bisphenols are now prohibited. Based on the potential for widespread use and available information on potential endocrine disruptors, reproductive toxicity and PBT/vPvB properties, 34[53] substances were identified in need for further regulatory risk management in EU[54].

The non-ionic APEO group of surfactants are produced in large volumes and their uses lead to widespread release to the aquatic environment. APEOs are highly toxic to aquatic organisms and degrade to more environmentally persistent compounds (alkylphenols). Ethoxylated nonylphenol and several other alkylphenols are included in the Candidate List due to endocrine disrupting properties.

Halogenated organic substances whereas organic substances that contain halogenated substances such as chlorine, bromine, fluorine, or iodine must not

52 http://www2.mst.dk/udgiv/publikationer/2010/978-87-92617-15-6/pdf/978-87-92617-16-3.pdf
53 Assessment of regulatory needs: Bisphenols. ECHA – 16 December 2021: Section 2.1: Bisphenols for which further EU RRM is proposed – restriction https://echa.europa.eu/documents/10162/c2a8b29d-0e2d-7df8-dac1-2433e2477b02
54 Annex XV restriction report https://echa.europa.eu/documents/10162/450ca46b-493f-fd0c-afec-c3aea39de487

appear in Nordic ecolabelled paints and varnishes. Halogenated organic substances include many substances that are harmful to health and the environment, in that they are very toxic to aquatic organisms, carcinogenic or harmful to health in some other way. Halogenated organic substances persist in the environment, which means they pose a risk of having harmful effects. There is therefore a requirement that halogenated organic compounds must not appear in indoor paint and varnishes. This means that substances such as brominated flame retardants, chlorinated paraffins, perfluoroalkyl compounds and certain plasticisers are not permitted in Nordic Ecolabelled indoor paint and varnishes.

Perfluorinated and polyfluorinated alkylated substances (PFAS) are a group of substances with undesirable properties. PFASs are defined as fluorinated substances containing at least one fully fluorinated methyl or methylene carbon atom (without any H / Cl / Br / I atom attached to it), i.e., with a few listed exceptions, all chemicals with at least one perfluorinated methyl group ($–CF_3$) or a perfluorinated the methylene group (–CF2–) is a PFAS as described in OECD 2021.[55] The substances are persistent and are readily absorbed by the body.

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

There are also halogenated pigments used in the paint industry. There is an exemption of the preservatives that fulfil O5 and for pigments fulfilling the EU requirements for pigments in food packaging according to Resolution AP (89) point 2.5. The reason for including a requirement that pigments need to fulfil Resolution AP (89) is that the Nordic Ecolabelling does not wish to allow PCBs at all but since it is not possible to set a zero limit for pigments, the Nordic Ecolabelling has chosen to use the same limit as in food packaging (Resolution AP (89) point 2.5). This level has been chosen since it is a well-known method in the industry and the low level used in food packaging is considered strict enough for indoor paint and varnishes. The exemption for these halogenated pigments is needed to make it possible to produce products with good colourfastness without choosing pigments with even worse environmental profile.

Isocyanates cause allergies and asthma and some, including TDI (toluene diisocyanate), are also suspected carcinogens. Any Occupational Exposure Limit, for occupational diisocyanate exposure, derived from the exposure-excess risk relation, will be associated with a residual excess risk for developing occupational asthma. The lower the exposure the lower the risk for developing asthma[56]. Nordic Ecolabelling has chosen to exclude the use of isocyanates, based on their problematic properties. Nordic Ecolabelling has chosen to do an exception for water-borne polyisocyanates with a chain length of more than 10, since they are

55 https://www.oecd.org/chemicalsafety/portal-perfluorinated-chemicals/terminology-per-and-polyfluoroalkyl-substances.pdf 2021
56 RAC Opinion on scientific evaliatopm pf pccupatopmaø exposure løimits for Diisocyanates. 11 June 2020. https://echa.europa.eu/documents/10162/4ea3b5ee-141b-63c9-8ffd-1c268dda95e9 (Accessed on 2022-11-15).

used in water-based paints, for example in binders. These long chain polyisocyanates are considered non-reactive since they are fully polymerised, which means fully reacted and stable. They are therefore unlikely to react and release isocyanates when used, for example when paint is applied.

Fragrances must not be present in Nordic Ecolabelled paints and varnishes. Nordic Ecolabelling is not aware of any fragrances being used in paints and varnishes but, since fragrances are gaining a foothold in many products, Nordic Ecolabelling wishes to prevent future use of fragrances in the product group.

O13 Emissions of Total Volatile Organic Compounds and Semi-Volatile Organic Compounds in indoor paints and varnishes

For Indoor paints and varnishes, the emissions of carcinogenic VOC and Total Volatile Organic Compounds (TVOCs) must not exceed limits given in Table 10. Emission of total Semi-Volatile Organic Compounds (TSVOCs) are not covered by a limit value but must be reported for the product.

Test method: Emission testing after 28-days according to EN 16516 or EN 16402 or other equivalent test methods.

For tinting systems, the emissions of TVOCs, SVOCs and carcinogenic VOC shall be determined for the colour with most tinting paste and the base paint with highest theoretical amount of TVOC and SVOC carcinogenic VOC from the contribution of raw materials.

The test laboratory must fulfil the requirements in Appendix 4.

Table 10 Emission limits for the final product for indoor paints and varnishes after 28 days

Product description (with subcategory denotation according to Directive 2004/42/EC)	1A and 1B carcinogenic VOC*	TVOC
a. b. d. e. f. g. h. i. j. l. All indoor products	≤ 0,001 mg/m^3	≤ 0,3 mg/m^3

* *Carcinogenic 1A and 1B VOCs listed in Annex H of EN 16516.*

✉ Test report in accordance with EN 16516, EN 16402 or other equivalent standardised test conditions and determination methods.

✉ Documentation showing that the test laboratory fulfils the requirements in Appendix 4.

O14 Content of Volatile and Semi-volatile Organic Compounds

For paints and varnishes the content of VOC and SVOC must not exceed the limits given in Table 11 and Table 12.

For tinting systems, the content of VOCs and SVOCs shall be determined for the colour with most tinting paste and the base paint with highest content of VOC and SVOC.

The VOC and SVOC content for paints and varnishes shall be determined either by testing the final product or by calculation based on the raw materials in accordance with test methods given in ISO 11890-2.

The test laboratory must fulfil the requirements in Appendix 4.

Products with the Nordic Swan Ecolabel may display the text ‘reduced VOC content’ and the VOC content in g/l next to the Ecolabel if they wish.

Table 11 VOC and SVOC content limits in its ready-to-use form paints and varnishes

Product description (with subcategory denotation according to Directive 2004/42/EC)	VOC limits (g/L ready to use)	SVOC limits (g/l ready to use)	
		White paints and varnishes	Tinted paints and varnishes
a. Interior matt walls and ceilings (Gloss < 25@60°)	10	30	40
b. Interior glossy walls and ceilings (Gloss > 25@60°)	40	30	40
c. Exterior walls of mineral substrate	25	40	
d. Interior/Exterior trim and cladding paints for wood and metal	80	50	60
e. Interior/Exterior trim varnishes and wood stains, including opaque wood stains	65	50	60
f. Interior and Exterior minimal build wood stains	50	30	40
g. Primers	15	30	40
h. Binding primers	15	30	40
i. On pack performance coatings	80	50	60
j. Two-pack reactive performance coatings for specific end use such as floors	65	50	60
l. Decorative effect coatings	80	50	60

Table 12 VOC content limits in its ready-to-use form for industrial paints

Industrial products falling under the scope of directive 2010/75/EU	VOC limits (g/L ready to use)
Industrial paints and varnishes for indoor use*	75
Industrial paints and varnishes for outdoor use*	75
Anti-corrosion paints	75

* Industrial powder paints and powder varnishes are exempted from the requirement.

✉ Declaration in line with Appendix 1 from the manufacturer of the product and Appendix 2 from the manufacturer of each raw material.

✉ Test report or calculation showing that the content level of VOC and SVOC in the final product in table 11 and table 12 is fulfilled, based on the test of the final product or on all ingoing raw materials using test methods given in ISO 11890-2.

✉ Documentation showing that the test laboratory fulfils the requirements in Appendix 4.

Background to requirement O13 and O14

Volatile Organic Compounds (VOCs) are used as solvents within paints to help keep it stable prior to use and aid in spreading and delivery of the paint to the substrate. VOCs generally evaporate or sublimate from the paint during and after application. The release of these emissions can cause eye, nose, and throat irritation along with headaches and loss of coordination. Due to the wide diversity of compounds encompassed by this classification, more extreme

reactions can also present, in particular: damage to liver, kidney, and central nervous system and some are suspected or known to cause cancer in humans[57].

The current requirement for VOC and Semi Volatile Organic Compounds (SVOC) has been reworked in addition to added VOC, introduce emission test requirement for indoor paints and varnishes, as well as a requirement for the ready-to-use SVOC in outdoor paints and varnishes. The requirement for VOC for outdoor paints has been kept from previous criteria generation as the standard EN 16516 is a method for determination in indoor air.

For Indoor Paints and Varnishes: It has been concluded that a requirement for the emission of paints and varnishes is also needed as indoor paints and varnishes may contain various VOCs that can be released to the indoor environment. Building materials emit chemical emissions into the indoor environment, which can affect the health of occupants. These emissions have therefore raised awareness about how the chemicals affect the human health[58, 59]. As people spend more time in indoor environments, it is necessary to measure and quantify indoor VOC emissions to prevent possible adverse health effects of indoor air pollution due to the toxic nature of many VOCs[60]. Furthermore, there is long-lasting persistence of many SVOCs indoors, even after removing their primary source. Indoors, SVOCs may persist for hundreds of hours or even for several years[61]. While emissions of SVOC must be reported, there is no specific limit value in the version of the criteria. The purpose is to report emission data of SVOC and in future revision set a limit value which is representative for products with lower emissions on the market.

The requirements for emission are derived from the EU-Taxonomy as well as the Norwegian environmental certification for buildings BREEAM-NOR[62]. Carcinogenic VOCs has been included in the requirement to be in line with the EU-Taxonomy.

For Outdoor Paints and varnishes: The decline in use of VOCs has led to an increase in the use of SVOCs. Construction and building products are a major source of SVOCs and the Construction Products Directive[63] has an optional criterion[64] that SVOCs need to be avoided within the sector[65]. Indoor SVOCs originate from indoor and outdoor sources. The major issue is that SVOCs can partition themselves among different phases and available surfaces[66], such as paints and onto other surfaces which increases their residence time indoors to several years. SVOCs may also react with indoor oxidants, such as hydroxyl

57 http://www.epa.gov/iaq/voc.html
58 Swedish Chemicals Agency (KemI). Action plan for a non-toxic everyday 2015–2020 – protect the children (in Swedish). Report 5. KemI, Sundbyberg, 2014.
59 Sundell J. (2004) On the history of indoor air quality and health.
60 Morin, J., Gandolfo, A., Temime-Roussel, B., Strekowski, R., Brochard, G., Bergé, V., ... & Wortham, H. (2019). Application of a mineral binder to reduce VOC emissions from indoor photocatalytic paints. Building and Environment, 156, 225-232.
61 Weschler, C. J., & Nazaroff, W. W. (2008). Semivolatile organic compounds in indoor environments. Atmospheric environment, 42(40), 9018-9040.
62 https://byggalliansen.no/wp-content/uploads/2022/03/BREEAM-NOR-v6.0_NOR.pdf (visited: 2022-08-30)
63 Council Directive 89/106/EEC
64 European Collaborative Action. Urban air, indoor environment, and human exposure. Report No 27; Harmonisation framework for indoor material labelling schemes in the EU (2010)
65 CEN/TC 351 Construction products: Assessment of the release of dangerous substances.
66 Wei, W et al., (2017). Reactivity of semivolatile organic compounds with hydroxyl radicals, nitrate radicals, and ozone in indoor air. International Journal of Chemical Kinetics, 49(7), 506-521.

radicals (OH), nitrate radicals (NO_3), and ozone, as such, they can be inhaled and ingested and pose a risk to health and environment[67]. Therefore, a requirement for SVOC for outdoor paints is justified due to their mobility to travel indoors as some SVOCs can cause adverse effects, as well as limiting their mobility in the biosphere[68].

The limit value for industrial paints falling outside the scope of 2004/42/EC has been adjusted from the previous value of 130 g/L for all products. The new value, 75 g/l is representative for the products intended use with similar products in accordance with 2004/42/EC and based on licensing data to better represent industrial paints on the market.

For anti-corrosion paint for industry and infrastructure, there is a steerability to minimize the emissions of VOCs. In a report on life cycle analysis of rust protection on bridges[69], it is concluded that solvent-based anti-corrosion paints have the largest climate impact with regards to formation of ground-level ozone. The limit value has been increased compared to previous version in order to allow anti-corrosion paints for broader application areas, while still limiting VOC-levels compared to traditional solvent-based anti-corrosion paints that can contain higher levels of VOC.

O15 Volatile Aromatic Compounds

Volatile aromatic compounds (VAC) must not be actively added to the product but may occur as residuals to a total maximum of 100 ppm (0.01 w%, 100 mg/kg) in the final product.

Volatile aromatic compounds are volatile organic compounds where one or more benzene rings are contained within the molecule.

✉ Declaration in line with Appendix 1 from the manufacturer of the product and Appendix 2 from the manufacturer of each raw material.

✉ Calculation of the level of volatile aromatic compounds in the product (based on data for all ingoing raw materials).

Background to requirement O15

VACs have specific environmental and human health impacts including DNA damage70. Exposure to these products should be minimised and any way to mandate a reduction in their use encouraged. The current criterion prevents their addition but allows their presence from residuals.

4.5 Binder requirements

The requirements in this section aims to promote raw materials with less climate impact, reduced energy consumption, increased energy efficiency, transition from fossil to sustainable raw materials, use of more renewable energy – and subsequently, reduced emissions of greenhouse gases. The requirements are divided in three parts depending on the binder type (acrylic resin, alkyd resin or

67 Salthammer, T et al., (2009) Occurrence, Dynamics, and Reactions of Organic Pollutants in the Indoor Environment
68 Harkov, R. (1989). Semivolatile Organic Compounds in the Atmosphere. In Air Pollution (pp. 39-68). Springer, Berlin, Heidelberg.
69 Life cycle analysis of anti-corrosion paints - bridges, Sweria IVF 2018
70 Environ Health Perspect. 2002 June; 110(Suppl 3): 451–488.

cement/hydraulic binders), where the specific binder type in question must fulfil the requirement where relevant below. The description of the chemical type of binder shall be derived from that component of the binder which is decisive for the characteristic properties of the final coating system.

O16 Acrylic and alkyd resin binders

The following requirements must be fulfilled if the product contains acrylic or alkyd resins:

1. The license holder shall have a a) supply chain policy and b) code of conduct for responsible sourcing of renewable raw materials* used in acrylic and/or alkyd resin binders used in Nordic Swan Ecolabelled paints and varnishes.

a) The supply chain policy shall include the following:
   - A policy statement committing the license holder to respect human rights and the environment within its operations and supply chain; this includes a commitment to support suppliers' compliance with the supplier code of conduct by engaging in responsible purchasing practices.
   - Commitment to comply with all appliable local, national- and international environmental laws and regulations, as well as all applicable health and safety regulations.
   - A description for governance processes in place for due diligence; this includes routines for assessing biodiversity and deforestation risk along the whole supply chain.

b) A supplier Code of Conduct, that informs all suppliers along the whole supply chain what is expected of them with respect to the Licensee's own supply chain policy regarding human rights and protecting the environment.

The supply chain policy and code of conduct must be both public and communicated to the supply chain.

2. Acrylic resin binders:
   - If renewable raw materials from palm oil are used in acrylic resins the palm oil must be RSPO certified. This also includes by-products, residues, and waste fractions from palm oil industries, such as palm fatty acid distillate and palm effluent sludge. Traceability must at least be ensured by mass balance. Book and claim systems are not accepted.
   - If any other renewable raw materials are used in acrylic resins, the raw material manufacturer of the acrylic resin must document:
     - Type of renewable raw material used in the acrylic resins (e.g., crops, sugarcane, source of bio-naphtha),
     - Whether the renewable raw materials are derived from primary feedstock or residue or waste,
     - Whether the renewable raw materials are certified according to any sustainability standards,
     - Level of traceability for certified products, (Identity Preserved, Segregated, Mass Balance, Book & Claim) on both the renewable raw materials used in the production of acrylic monomers and the acrylic resin itself.

3. Alkyd resin binders:
    - Fatty acids used in alkyd resin binders must be made from renewable or recycled raw materials.
    - Renewable raw materials from palm oil must not be used in fatty acids in alkyd resin. The requirement also includes by-products, residues, and waste fractions from palm oil industries, such as palm fatty acid distillate and palm effluent sludge.
    - The raw material manufacturer of the alkyd resin must document:
        - Type of renewable raw material used in the alky resins (e.g., castor oil, tall oil, rapeseed oil, soybean oil),
        - Whether the renewable raw materials are derived from primary feedstock or residue or waste,
        - Whether the renewable raw materials are certified according to any sustainability standards,
        - Level of traceability for certified products, (Identity Preserved, Segregated, Mass Balance, Book & Claim) on the renewable raw materials used in the production of alkyd resins.

***** *Renewable raw materials compose of biomass and that can be continually replenished for example wood, crops, marine products, organic waste.*

✉ Submit both supply chain policy and supplier code of conduct, together with information on how these are public and communicated to the supply chain.

✉ Declaration in line with Appendices 1 or 2 from the manufacturer of the product or the manufacturer of each raw material, respectively.

Acrylic resin binders:

✉ Invoices/delivery notes/order confirmation which document purchase of RSPO certified raw materials. The information on the document must include information on type of traceability (Segregated, identity preserved or mass balance)

✉ The raw material manufacturer must provide information on the raw material(s) according to the requirement in Appendix 2

Alkyd resin binders:

✉ Declaration from the licensee stating that a) fatty acids used in alkyd resin binders are made from renewable raw materials or recycled raw materials and b) renewable raw materials from palm oil are not used in fatty acids in alkyd resin.

✉ The raw material manufacturer must provide information on the raw material(s) according to the requirement in Appendix 2

Background to requirement O16

Acrylic resins

This is a new requirement in generation 4 of the criteria. Implementing a supply chain policy and code of conduct for responsible sourcing of renewable raw materials is important for the license holder of paints and varnishes. It helps to minimize environmental impact, improve social practices, and meet regulatory and customer expectations. The purpose of documenting the supply chain policy and code of conduct is a commitment to transparency and reporting on the company's practices in order for a more sustainable and socially responsible production process.

The general environmental benefit of bio-based plastics comes from the shift from fossil feedstock to bio-based feedstock. Traditionally acrylic resins are fossil-based but there is a shift in the industry towards the use of bio-based polymers for coatings. Although a full shift is deemed too early due to supply and demand issues of biobased naphtha and 1st generation feedstock, there are environmental gains that can be made by setting a requirement to encourage the use of biobased material to reduce greenhouse gas emissions, while maintaining the same product quality in order to make sure the product has a long lifetime.

If renewable raw materials are used in acrylic resins the manufacture of acrylic resins must provide Nordic Ecolabelling with information on type and status (primary feedstock, waste or residue) of renewable raw materials and level/description of traceability used on both raw materials and the acrylic resin itself. Palm oil can be used in the production of acrylic resins, and because palm oil is linked to environmental and social issues, only palm oil that is RSPO certified is allowed to ensure that the palm oil comes from sustainable sources.

Alkyd resins

Alkyd resins are oil-based polyesters consisting of dibasic acid, polyols, and fatty acids. The fatty acid content and polyol of alkyd resins are compared to dibasic acids often derived from renewable raw materials (animal or vegetable oils). As with acrylic resins, the general environmental benefit of bio-based plastics comes from the shift from fossil feedstock to bio-based feedstock. Therefore, fatty acids in alkyd polymers used in Nordic Swan Ecolabelled paints and varnishes must be made from renewable raw materials.

Alkyd polymer production is based on the use of vegetable oil, where advantages of the oil include the use of a renewable raw material which is sustainable and being environmentally friendly[71]. Vegetable oil can be derived from many different raw materials, but it is important to determine the potential for each raw material and find the most sustainable ones, as alkyds can be derived from anywhere from palm oil to tall oil. However, not all raw materials are sustainable. There are several factors that influence the sustainability of bio-based products. For example, the agricultural process has a large impact on the sustainability of vegetable oils[72]. The environmental impact of raw materials can

71 Amelia, Okta, et al. (2021) Eco-friendly Alkyd Resins Based on Vegetable Oil. Jurnal Rekayasa Proses.
72 Alcock. Thomas et al. (2022): More sustainable vegetable oil: Balancing productivity with carbon storage opportunities

be reduced if vegetable oils are produced on plantations managed sustainably, so that pesticides and unsustainable crop overexploitation are avoided.

Furthermore, there is incentive to utilize oils based on co-products from other industries, like pulp and paper or used cooking oils, as it is advised to avoid a burden shift of food-competing crops, because they could create a strong competition for land and water used for food production. With an increase in competition of land and water use, so does risk of deforestation and destruction of ecosystems increase due to urbanization and plant expansion. Palm oil is prohibited in alkyd resins as with increasing production and demand, the potential for producing all palm oil sustainably is limited. Furthermore, there are other alternative vegetable oils as to avoid the use of palm oil. For that reason, palm oil should only be used in products where a sustainable alternative is difficult to find.

The traceability of renewable raw materials is increasingly important for ensuring sustainability and ethical sourcing in the production of various products. Different levels of traceability have been developed to help companies and consumers understand the origin and sustainability of the raw materials they use.

The highest level of traceability is "Identity Preserved," which involves keeping raw materials from a specific source or batch physically separate throughout the entire supply chain. This allows for full traceability and verification of the origin and sustainability of the raw materials.

"Segregated" is the next level of traceability, where different batches or sources of raw materials are kept separate throughout the production process. This allows for traceability and verification of the origin of the raw materials but does not guarantee that the raw materials are from a specific source or batch.

"Mass balance" is a method for tracking the flow of raw materials throughout the supply chain. It involves assigning a percentage of the total raw material inputs to each stage of the process, based on the amount of material that is physically present at each stage. This allows for traceability and verification of the sustainability of the raw materials but does not guarantee that the final product contains materials from a specific source or batch.

"Book and Claim" is a certification scheme that allows companies to claim that they have used a certain amount of renewable raw materials in their products, without actually physically separating and tracking the materials. Instead, the company purchases certificates from a certification body, which represent a certain amount of renewable raw materials that have been sustainably produced. This allows for claims about the sustainability of the product but does not guarantee that the raw materials used in the product are actually from sustainable sources.

O17 Cement/Hydraulic binder

For cementous raw materials or building lime raw materials used in the product, the total Global Warming Potential (GWP) for system boundaries A1, A2 and A3 according to EN 15804+A2 and EN 16908+A1 shall not exceed the limit values in Table 7. The data quality must fulfil quality level Fair or better, in accordance with EN 15804+A2, Annex E Table E.1 and E.2.

The Environmental Product Declaration (EPD) must be product/plant specific, and 3rd party verified. The reported values must reflect the absolute gross* CO2 emissions.

The raw material manufacturer of cement must declare the cement to clinker ratio for the raw material. The clinker factor must be calculated according to EN 197.

Table 13 Limit values for product specific emissions of cementous raw materials or lime based on clinker to cement ratio.

Clinker to cement ratio	**Gross GWPtot** (kgCO2e/tonne cement clinker)
Grey cement	
0,0	264
0,1	320
0,2	376
0,3	432
0,4	488
0,5	544
0,6	601
0,7	657
0,8	713
0,9	769
1,0	825
Lime	820
White cement	
0,0	330
0,1	400
0,2	470
0,3	540
0,4	610
0,5	681
0,6	751
0,7	821
0,8	828
0,9	925
1,0	1023

** Absolute gross CO_2 emissions are the fossil and direct CO_2 emissions. Gross emissions include CO_2 from alternative fossil fuels. However, CO_2 emissions from biomass fuels and on-site power generation can be excluded from the calculation.*[73]

✉ Product-Specific Type III Environmental Product Declaration (EPD) in accordance with ISO 14025, EN 15804+A2 and EN 16908+A1. The data quality must fulfil quality level Fair or better, in accordance with EN 15804+A2, Annex E Table E.1 and E.2.

✉ Documentation from the license holder showing that the specific cement or hydraulic binder is used in the product.

✉ Product data sheet or declaration of performance from the raw material manufacturer showing the exact cement to clinker ratio and cement type for the raw material.

[73] CO2 and Energy Accounting and Reporting Standard or the Cement Industry, Version 3.0 (2011)

☒ Declaration in line with Appendices 1 or 2 from the manufacturer of the product or the manufacturer of each raw material, respectively.

Background to requirement O17

The environmental impact of cement production is predominantly driven by the clinker content, which is a key component in most cement-based products. These products typically contain Portland cement, hydrated lime, and calcium carbonate, with Portland cement being the primary ingredient. This is significant because Portland cement production is one of the major sources of greenhouse gases globally, accounting for approximately 5% of carbon dioxide emissions[74]. It is estimated that 900 grams of CO2 are released for every 1000 grams of cement produced, leading to an annual emission of about 3.24 billion tons of CO2[75].

Given this substantial environmental footprint, it is necessary to set requirements that effectively reduce energy demand and limit CO_2 emissions[76]. The requirement is based on the clinker-to-cement ratio, which is the most accurate way to assess the environmental impact of different cement types. This approach ensures that GWP limits are directly proportional to the clinker content, thereby reflecting the true carbon intensity of each product. It prevents the unfair penalization of lower clinker cements by setting realistic and representative GWP limits.

The limit values in the requirement are based on CEMBUREAU's[77] framework for low carbon cement definition. While the data from CEMBUREAU is presented in net values, Nordic Ecolabelling has decided to set limit values based on gross values which accounts for an average additional 10% based on the net value. Net values subtract emissions related to the combustion of alternative fossil fuels, such as used tires[78]. This subtraction can sometimes obscure some environmental impact of cement production. The limit value is based on current EPDs and available data, though the current publicly available data is inconsistent due to varying calculation methods and data quality. Demanding improved data quality will lead to more accurate figures on CO_2 emissions, contributing to greater transparency within the industry regarding actual emissions. This transparency is essential for establishing benchmark levels for future generations of criteria.

Nordic Ecolabelling believes that calculating gross values provides the most transparent and accurate assessment of environmental impact. By including all emissions from alternative fossil fuels, gross values offer a more representative evaluation of the total greenhouse gas emissions associated with cement production. This comprehensive approach ensures that the environmental costs of all fuels used in the process are fully accounted for. Further, reporting gross

74 The Cement Sustainability Initiative: https://docs.wbcsd.org/2016/12/GNR.pdf (visited 2022-05-30)
75 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.
76 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
77 https://cembureau.eu/media/dnbf4xzc/activity-report-2023-for-web.pdf
78 CO_2 and Energy Accounting and Reporting Standard or the Cement Industry, Version 3.0 (2011)

values also encourages companies to focus on energy savings and reducing emissions across the board, regardless of their source.

The limit values for white cement are set based on data trends from facilities producing lower-impact white cement, as this type has a higher climate footprint than grey cement due to its energy-intensive process and higher purity raw materials. However, recognizing its role in specific applications, we permit its use.

Nordic Ecolabelling prioritizes locally produced cement to reduce transport emissions and ensure alignment with regional standards, minimizing the carbon footprint and enhancing data reliability. Requirements are based on gross CO_2 values, which include emissions from all fuel sources, providing a transparent view of environmental impact and encouraging production efficiency. We see potential for improvement in white cement production, as shown in publicly available EPD data and have set limit values to align with products on the market that can be improved to meet these requirements.

4.6 Quality requirements

For quality requirements for different paints and varnishes, an overview of the tests required per type of paint and/or varnish has been added, as viewed in Table 14. For full information regarding each quality requirement and paint type, see the specific requirements in the sections starting from 4.7.

For all the following tests all test laboratories must fulfil the general requirements according to standard EN ISO/IEC 17025 or be an official GLP approved laboratory. Alternatively, the companies own laboratory can work as a test laboratory if the laboratory is included by the company quality system, see Appendix 4.

Table 14 Performance requirements for different types of paints and varnishes (industrial not included)

Performance requirements for different types of paints and varnishes with subcategory denotation according to Directive 2004/42/EC								
Requirement	**Indoor paint (a, b)**	**Outdoor paint (c)**	**Trim and cladding (d)**	**Thick decorative coating indoor and outdoor (l)**	**Varnish and woodstain (e, f)**	**One and two pack performance and floor covering paint (i, j)**	**Primer (g)**	**Undercoat and primer (h)**
O20 Spreading rate *(only for white and light-coloured paints, including the white base paint used in tinting systems) – ISO 6504/1. Not applicable to varnishes, lasures, transparent adhesion primers or any other transparent coating.*	8 m^2/L 4 m^2/L (elastomeric paint)	-	Indoor products 8 m^2/L	Indoor products 1 m^2/L	-	Indoor products 8 m^2/L	6 m^2/L (without having specific properties) 8 m^2/L (with opacity)	6 m^2/L (without specific properties) 8 m^2/L (with opacity)
O21 Resistance to water – ISO 2812-3	-	-	-	-	Resistant to water	Resistant to water	-	-
O22 Adhesion – EN ISO 4624 and EN ISO 2409	-	-	-	-	-	Score 2	1,5 MPa (masonry paint)	1,5 MPa (masonry paint)

Performance requirements for different types of paints and varnishes with subcategory denotation according to Directive 2004/42/EC								
Requirement	**Indoor paint (a, b)**	**Outdoor paint (c)**	**Trim and cladding (d)**	**Thick decorative coating indoor and outdoor (l)**	**Varnish and woodstain (e, f)**	**One and two pack performance and floor covering paint (i, j)**	**Primer (g)**	**Undercoat and primer (h)**
							Score 2 (transparent, metal and wood primers	Score 2 (transparent, metal and wood primers)
O23 Abrasion – EN ISO 7784-2/ISO 5470-1	-	-	-	-	-	70 mg weight loss	-	-
O24 Weathering – EN 16473-3/EN 927-6	-	1 000 h 2 016 h (wood paint, stains and varnishes)	1 000 h (outdoor)	1 000 h (outdoor)	1 000 h (outdoor) 840 h (wood oils)	1 000 h (outdoor)	-	-
O25 Water vapour permeability ([1]) – EN ISO 7783-2 / EN 1062-1 / ISO 12572	-	Class II or better (masonry or concrete) Class I (masonry or concrete according EN 1504-2)	-	Class II or better (masonry or concrete) Class I (masonry or concrete according EN 1504-2)	-	-	-	-
O26 Liquid water permeability ([1]) EN 1062-3	Where claims are made Class III (masonry and concrete) All other products Class II or better (masonry and concrete)	-	Class II or better (masonry or concrete)	-	-	-	-	-
O27 Fungal growth – EN 927-3, ISO 15457, EN ISO 4628-1	-	Class 0 (wood paints) Class 2 or lower (masonry paints)	Class 0 (outdoor wood products)	Class 1 or lower (outdoor)	-	-	-	-

4.7 Quality requirements for indoor paints and varnishes

O18 Claims of Wet Scrub Resistance

All wall and ceiling paints for which claims of class 1 or 2 in wet scrub is made shall achieve the claimed class according to class 1 or class 2 in wet scrub resistance (WSR) according to EN 13300 and EN ISO 11998. This requirement only applies to tinting bases (base paints).

The test laboratory must fulfil the requirements in Appendix 4.

For tinting systems or a paint series with different colours this requirement only has to be demonstrated for one of the paints.

✉ The applicant shall provide a test report according to EN 13300 using the method EN ISO 11998 (Test for cleanability and scrub resistance). For ceiling paints and indoor wall paints the labelling for the packaging, including the accompanying text, shall be provided as evidence regarding claims of wet scrub resistance.

✉ Documentation showing that the test laboratory fulfils the requirements in Appendix 4.

Background to requirement O18

Wet scrub is only relevant for products in these criteria which are wall or ceiling paints. Nordic Ecolabelling finds it important that claims made on Nordic Ecolabelled products are supported by evidence of the claims. Therefore, it is relevant to prove claims on wet scrub by tests. This is important for the final consumer of the product who uses the paint and wants to be able to rely on the fact that Nordic Swan Ecolabelled products are good quality products and still have a low environmental impact.

O19 White pigment content

Indoor wall and ceiling paints for which Class 1 and 2 wet scrub resistance* claims are made shall have a white pigment content (white inorganic pigments with a refractive index higher than 1.8) per m^2 of dry film equal to or lower than that described in Table 15, with 98 % opacity.

All other paints shall have a white pigment content (white inorganic pigments with a refractive index higher than 1.8) per m^2 of dry film equal to or lower than that described in Table 16, with 98 % opacity.

For tinting systems this requirement only applies to the base paint with the highest white pigment content or for the paint in a paint series with the highest white pigment content.

** Wet scrub resistance is here defined in accordance with EN 13300 and EN ISO 11998, see requirement O18.*

Table 15 Limit values for white pigment content for wall and ceiling paints for indoor use marketed with claims of wet scrub resistance.

Wet scrub resistance	Indoor limit (g/m^2)
Class I	40
Class 2	36

Table 16 Limits for white pigment content for products not covered by Table 15.

Type of paint	Indoor limit (g/m^2) with 98% opacity
Wall paints	25
Other paints (including ceiling paints)	36

☒ The applicant shall provide calculation or documentation showing that the content of white pigments is compliant with this requirement.

☒ For ceiling paints and indoor wall paints, the labelling for the packaging, including the accompanying text, shall be provided as evidence regarding claims of wet scrub resistance.

Background to requirement O19

Pigments and titanium dioxide are significant contributors to the environmental impact of paints. Pigments are important in enhancing the performance of the paints. To minimize the impact on the environment but still maintain a high performing paint, limits have been set on the amounts of white pigments.

Pigments have effect on the opacity of paint, therefore any reduction in use must be balanced against a reduction in the performance. Paint spreading performance is defined within the Spreading Rate criterion (EU Ecolabel 3a[79],) and is directly linked to the amount of pigment added to the paint.

The definition of white inorganic pigments with a refractive index higher than 1.8 is taken from the EU Ecolabel. This means that if the refractive index is below 1.8, they are not covered by this requirement.

O20 Spreading rate

The spreading rate should be at least at the levels presented in Table 17 below.

This requirement does not apply to varnishes, wood stains (lasures), transparent adhesion primers or any other transparent coatings.

- For paint series that are available in more colours the spreading rate shall apply to the lightest colour.
- For tinting systems, this requirement applies only to the white base (the base containing the most TiO_2). In cases where the white base is unable to achieve this requirement, the requirement shall be met after tinting the white base to produce the standard colour RAL 9010.
- For paints that are a part of a tinting system, the applicant must advise the end-user on the product packaging and at the Point of Sale which shade or primer/undercoat (if possible, bearing the Nordic Swan Ecolabel/EU-Ecolabel) should be used as a basecoat before applying the darker shade.
- The test laboratory must fulfil the requirements in Appendix 4.

79 Commision decision of 28 May 2014. https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:02014D0312-20211026&from=EN

Table 17 Spreading rate

Type	Opacity/hiding power	Spreading rate of at least the following
White paints and light-coloured paints (tri-stimulus (Y-value) > 70%) (including finishes and intermediates) *, **	Hiding power 98%	8 m^2 per litre of product
Semi-transparent primers	Without opacity or having specific properties *** With opacity	6 m^2 per litre of product 8 m^2 per litre of product
Thick decorative coatings (paints that are specially designed to give a three-dimensional decorative effect and are therefore characterised by a very thick coat)	Not relevant	1 m^2 per kg of product
Opaque elastomeric paints	Opaque	4 m^2 per litre of product

** Base paints to be used with a tinting system.*

*** Products marketed for both — indoor and outdoor shall have a spreading rate (at a hiding power of 98 %) of at least 8 m^2 per litre.*

**** Opaque primers with specific blocking/sealing, penetrating/binding properties* and *primers with adhesion properties.*

✉ The applicant shall provide a test report using one of the following:

- The method ISO 6504/1 (Paints and varnishes — determination of hiding power — Part 1: Kubelka-Munk method for white and light-coloured paints) or
- ISO 6504/3 (Part 3: determination of contrast ratio (opacity) of light-coloured paints at a fixed spreading rate) or
- For paints specially designed to give a three-dimensional decorative effect and characterised by a very thick coat the method NF T 30 073.

✉ For bases used to produce tinted products not evaluated according to the abovementioned requirements, the applicant shall produce evidence of how the end-user will be advised to use a primer and/or grey (or other relevant shade) of undercoat before application of the product.

✉ Documentation showing that the test laboratory fulfils the requirements in Appendix 4.

Background to requirement O20

A key environmental consideration is the amount of paint used during application. Minimising the amount of paint used, whilst achieving a high-quality finish can result in significant environmental savings. The most appropriate criterion by which this can be monitored is through the paints spreading rate. The requirement is intended to recognise products that are more efficient. The requirement therefore varies according to the opacity of primers (and therefore also hiding power).

To encourage the correct usage of the products the applicant shall advice the end user of tinting systems on how to obtain the optimal result by using the correct

shade or primer as a first layer before applying the darker shade, by information on the packaging and at the place where the product is sold (Point of Sale).

O21 Resistance to water

All varnishes, floor coatings and floor paints (e.g., with subcategory denotation e, f, i, and j according to Directive 2004/EC) shall have resistance to water, as determined by EN ISO 2812-3 such that after 24 hours' exposure and 16 hours' recovery no change of gloss or of colour occurs.

- Gloss measurement: A change of no more than ±5 gloss units (GU), measured in accordance with EN ISO 2813 or an equivalent method appropriate for the gloss level of the coating.
- Colour measurement: A colour difference of no more than $\Delta E \leq 0.3$ measured in accordance with EN 18314-1 or an equivalent colorimetric method.

✉ The applicant shall provide a test report using the method EN ISO 2812-3.

✉ Documentation showing that the test laboratory fulfils the requirement in Appendix 4.

Background to requirement O21

This test is important to show that water-resistant paints have the claimed functions. In addition to being resistant to abrasion, paints used on floors must also be resistant to water. Water resistance is tested in accordance with EN ISO 2812-3, Part 3: Method using an absorbent medium.

The current test protocol follows the latest available version of EN ISO 2812-3. In the previous version of the criteria, only floor varnishes, floor coatings, and floor paints were required to have resistance to water. With this revision, the criteria have been clarified to include all varnishes and wood stains.

To ensure a standardized evaluation of gloss and colour changes, measurements should be performed using EN ISO 2813 for gloss and EN ISO 18314-1 for colour, or an equivalent method suitable for the coating type. This ensures that water resistance is assessed with appropriate, industry-accepted measurement techniques.

O22 Adhesion

- Pigmented masonry primers for indoor walls (with subcategory denotation g and h according to Directive 2004/EC) shall score a pass in the EN ISO 4624 pull-off test where the cohesive strength of the substrate is less than the adhesive strength of the paint, otherwise the adhesion of the paint must be in excess of a pass value of 1.5 MPa.
- Floor coatings, floor paints, floor primers, masonry primers, transparent primers, metal, and wood primers for indoor use (with subcategory denotation g, h, i, and j according to Directive 2004/EC) shall score 2 or less in the EN ISO 2409 test for adhesion.

Non-film forming transparent primers are exempt from this requirement.

The test laboratory must fulfil the requirements in Appendix 4.

The applicant shall evaluate the primer and/or finish alone, or both applied together. When testing the finish alone, this shall be considered the worst-case scenario concerning adhesion.

✉ The applicant shall provide a test report using the method EN ISO 2409 or EN ISO 4624.

✉ Documentation showing that the test laboratory fulfils the requirements in Appendix 4.

Background to requirement O22

Adhesion is an important parameter for paints which shows that the products (primers, one-pack performance, and floor coatings) have good adhesion to the substrate/paint as a quality check of the product.

For primers for interior walls good adhesion properties (e.g., on plaster) are the main attribute of these products and something that the consumer will find very important when using the product. According to EN ISO 2409 best result is 0 and worst is 5.

Non-film-forming transparent primers are exempt from the requirement. EN ISO 2409 evaluates adhesion of a continuous coating by cutting through a measurable film. These products penetrate the substrate and do not leave a surface film, so the result is not meaningful and mainly shows substrate damage. Transparent primers that do form a film are not covered by this exemption and must be tested according to the criterion.

If there is doubt, the applicant should provide evidence that the product is non-film-forming. A short statement from an independent test institute is preferred. An internal lab statement can be accepted if it includes a brief method description and objective findings, for example negligible dry film build or microscopy showing penetration without a surface layer. Nordic Ecolabelling may request third-party confirmation if needed.

O23 Abrasion

- Floor coatings and floor paints (with subcategory denotation i and j according to Directive 2004/EC) shall have an abrasion resistance not exceeding 70 mg weight loss after 1000 test cycles with a 1000 g load and a CS10 wheel according to EN ISO 7784-2.
- Alternatively, a test according to ISO 5470-1 with 1000 test cycles with 1000 gram load and the H22 wheel where the weight loss is maximum 3000 mg.

✉ The applicant shall provide a test report showing compliance with this requirement using the method EN ISO 7784-2 or ISO 5470-1.

✉ Documentation showing that the test laboratory fulfils the requirements in Appendix 4.

Background to requirement O23

Surfaces subject to heavy wear, e.g., floors, need to be painted/coated with paints or varnishes that are highly resistant to abrasion to give the floor coating a longer life span. One way of testing wear resistance of paints is by performing an abrasion resistance test according to EN ISO 7784-2.

If a product (paint or varnish) fulfils the requirement of abrasion it needs to have an abrasion resistance not exceeding 70 mg weight loss after 1000 test cycles with a 1000 g load and a CS10 wheel.

4.8 Quality requirements for outdoor paints and varnishes

If there is no relevant quality test for a specific product mentioned below, Nordic Ecolabelling can extend the requirements for quality tests during the validity of the criteria to include other relevant tests.

O24 Weathering test for outdoor paints and varnishes

Products shall be exposed to artificial weathering in special apparatus including UV fluorescent lamps and condensation or water spray according to the respective tests mentioned.

- Masonry paints shall be exposed to test conditions for 1000 hours (6 weeks) (UVA 4h/60ºC + humidity 4h/50ºC) according to ISO 16474-3.
- Metal finishes shall be exposed to test conditions for 500 hours (6 weeks) (UVA 4h/60ºC + humidity 4h/50ºC) according to ISO 16474-3.
- Wood paints, wood stains (lasure) and varnishes shall be exposed to test conditions for 2016 hours (12 weeks) according to EN 927-6.
- Wood oils shall be exposed to test conditions 840 hours (5 weeks) according to EN 927-6.

The following results of the weathering test are also to be reported:

- Flaking (according to ISO 4628-5). The product is to have a flake density of 2 or less, and a flake size of 2 or less. The requirement is not applicable to non-film forming wood oils.
- Cracking (according to ISO 4628-4). The product is to have a crack quantity of 2 or less and a crack size of 3 or less. The requirement is not applicable to non-film forming wood oils.
- Blistering (according to ISO 4628-2). The product is to have a blister quantity of 3 or less and a blister size of 3 or less. The requirement is not applicable to non-film forming wood oils.
- The colour change (according to EN ISO/CIE 116 64-4 or EN ISO 116 64-6) shall not exceed $\Delta E^*=4$ with respect to the initial value. The requirement is not applicable to varnishes, bases and non-film forming wood oils.
- Decrease in gloss (according to EN ISO 2813) shall not be greater than 30% of initial value – matte paints and varnishes with an initial gloss value less than 60% at 60° angle of incident are exempted from the requirement. The requirement is not applicable to non-film forming wood oils.
- Chalking (according to EN ISO 4628-6) for masonry paints and metal finishes. The product shall achieve at least 1.5 or more, i.e., 0.5 or 1.0. In the standard there are pictorial reference standards. The requirement is not applicable to non-film forming wood oils.
- General appearance (according to EN ISO 4628-1).

If an entire paint system is Nordic Swan Ecolabelled, all bases and colours must fulfil the requirements. This can be documented by testing at least three representative products – at least one white, one intermediate colour and one dark colour – to show fulfilment of the quality requirement.

✉ Test report from a laboratory in line with Appendix 4 which clearly shows that the requirement is fulfilled.

O25 Water vapour permeability for masonry paints for outdoor use

If masonry and concrete paints (with subcategory denotation c and l according to Directive 2004/EC) are marketed as water vapour permeable or similar claims are made, the paints are to be classified as Class II, i.e., with average water vapour permeability or better according to test method EN ISO 7783-2 and classified according to EN 1062-1 or EN 1504-2*. Due to large numbers of possible tinting colours, this criterion will be restricted to testing of the base paint. Alternative test method such as ISO 12572 is also accepted. This requirement is not applicable for transparent primers.

** Masonry paints tested according to EN1504-2 must fulfil class I.*

✉ Test report from a laboratory in line with Appendix 4 which clearly shows that the requirement is fulfilled.

O26 Liquid water permeability for masonry paints for outdoor use

If masonry and concrete paints (with subcategory denotation c and l according to Directive 2004/EC) are marketed as water repellent/hydrophobic or similar claims are made, the paints are to be classified as Class III, i.e., with low liquid water permeability according to DIN EN 1062-3. Due to large numbers of possible tinting colours, this criterion will be restricted to testing of the base paint.

✉ Test report from a laboratory in line with Appendix 4 which clearly shows that the requirement is fulfilled.

O27 Fungal growth

If the product contains dry film preservatives with anti-fungal and/or anti-algal properties, it shall be tested according to EN 15457, EN 15458 or EN 927-3 (or equivalent), with evaluation carried out according to EN 16492 and EN ISO 4628-1.

Products intended for mineral substrates (subcategory c, Directive 2004/42/EC) must achieve a rating corresponding to ≤10% fungal growth (i.e. rating ≤2 in BS 3900:G6 or rating ≤1 in EN 15457, or equivalent).

Products intended for wood (subcategory d, Directive 2004/42/EC) must achieve class 0 when tested according to EN 15457 or EN 927-3 (or equivalent). If EN 15457 is used, assessment is macroscopic, and microscope use is optional. If EN 927-3 is used, assessment shall follow EN ISO 4628-1: no detectable defects (rating 0, Table 1) and no defects visible under 10× magnification (rating 0, Table 2).

Due to large numbers of possible tinting colours, this criterion will be restricted to testing of the base paint.

✉ Test report from a laboratory in line with Appendix 4 which clearly shows that the requirement is fulfilled.

O28 Powder paints and varnishes for outdoor use

Powder paints for outdoor use must meet the quality requirements in Qualicoat or in the GSB standard GSB AL 631 (Aluminium) or GSB ST 663 (Steel and Galvanised steel).

✉ Certificate from Qualicoat or GSB showing that the product meets the requirements applicable to the product.

Background to requirement O24-O28

The quality requirements for outdoor paints and varnishes are based on the requirements set out in the EU Ecolabel criteria for outdoor paints and varnishes[80]. There are, however, certain differences.

In the Nordic region, it is rare for outdoor floors, masonry, or concrete to be painted, compared with practices in the rest of Europe. It is therefore not considered relevant to have a compulsory requirement concerning adhesion of these products in the Nordic region, although such a requirement can be found in the EU Ecolabel criteria for outdoor paints and varnishes.

The requirement concerning weathering tests is the same as the stipulations in the EU Ecolabel criteria for outdoor paints and varnishes, since these tests are conducted to establish the effects of the weather on the product. The stated laboratory methods do not generate absolute figures or results for the product in the way that natural weather exposure would. However, they are a good indication of how the product will weather and of compliance with the requirements concerning flaking, cracking, and blistering. When it comes to products in a system the tests are to be performed on the complete system, i.e., with recommended film thickness etc.

Wood oils have been included in the requirement and must be tested according to 927-6. Although the standard does not mention wood oils explicitly, it can still be used to evaluate the weathering properties of film forming wood oils by exposing the samples to simulated outdoor conditions because wood oils can easily suffer from flaking, cracking, and blistering. If you see cracking, it is an expression that the wood oil has not protected the wood well enough during the test period. Therefore, the test result can provide valuable information about the wood oil's durability and performance under different weather conditions.

If the product is marketed as breathable (water vapour permeable), water repellent (low liquid water permeability), resistant to fungal growth or similar, this is to be documented via a performance test. The requirement in the EU Ecolabel criteria for outdoor paints and varnishes has been implemented with a few minor modifications. For example, there is the addition that an “equivalent test” may be used, which allows the applicant to use a different test for this on condition that the test is equivalent to what is required in the criteria document and that the requirement level is fulfilled.

Water vapour permeability for concrete has been according to method ISO 7783. In that method the evaluation of the test has been done according to EN 1062-1 with three different classes. EN 1062-1 includes products for mineral surfaces and cement. There is another standard, EN 1504-2, which is also used to evaluate into three classes. It is mainly for surface treatment/protection of cement. The limits of the two standards, water vapour diffusion, are numerically different:

<u>EN 1062-1</u>
Class I sD <0.14 m, class II 0.14 m ≤ sD < 1.4 m and class III sD > 1.4 m

80 Commision decision of 28 May 2014. https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:02014D0312-20211026&from=EN

EN 1504-2
Class I sD <5 m, class II 5 m ≤ sD < 50 m and class III sD > 50 m.

Both methods are considered as comparable, but if the EN1504-2 is to be used for façade paint class I needs to be fulfilled otherwise the requirement will be too tough. For other types of paint class II is to be fulfilled.

Powder paints for outdoor use must meet the quality requirements stated in the GSP standard or in Qualicoat. The two systems are considered equivalent, meaning that a certificate showing compliance with one of the standards is sufficient to prove the quality of the product.

4.9 Quality requirements for industrial paints and varnishes

Industrial paints and varnishes are applied to furniture, wall panels, floors and similar or used within infrastructure (anti-corrosion paints). The quality of these products is to be tested according to the methods that are relevant for the purpose of the paint/varnish as follows:

- Industrial paints and varnishes for exterior use has to fulfil the relevant parts of O24, O25, O26, O27 and O28
- Furniture – O29 according to the criteria of "Möbelfakta"[81]
- Panels, UV-cured floors and similar – O30 (scratch resistance)
- Paints and varnishes for painting/coating floors, including UV-cured floors – O31 and O32 (Abrasion/wear and water resistance)
- Anti-corrosion paints for industry and infrastructure – O33

If there is no relevant quality test for a specific product mentioned above, Nordic Ecolabelling can expand the requirements for quality tests during the validity of the criteria to include other relevant tests.

O29 Quality requirements for industrial paints and varnishes for furniture

Indoor and outdoor industrial paints and varnishes for furniture must meet the requirements according to table 18 and 19 below. The test must be carried out according to the current version of the standard of the "Möbelfakta"[90] criteria. When updating the standard during the validity period of the license, it is the responsibility of the licensee to ensure that the requirements of the new valid version of the standard are met.

Table 18 Requirement levels for varnished surfaces in different furniture groups.

Furniture group	Area	Requirement
Seating	Undercarriage	Requirement level 1
	Seat, backrest, and armrests	Requirement level 2
Storage units	Undercarriage and interior surfaces including box bottoms, but not vertical surfaces, e.g., backs	Requirement level 1
	External horizontal surfaces	Requirement level 2
Tables	Undercarriage	Requirement level 1
	Tabletops	Requirement level 4
	Tabletops intended for intensive use in a public environment (e.g., restaurant, cafe, school)	Requirement level 5
Kitchen	Internal surfaces, including drawer bottoms, but not shelves and bottoms and vertical surfaces, e.g., backs	Requirement level 1

81 https://www.mobelfakta.se/uploads/files/1011_kravspecifikation_2021-11-01_14_2.pdf

	External surfaces, shelves, and bases	Requirement level 3
	Worktops (tabletops)	Requirement level 6

Table 19 Test methods and requirement levels for furniture tests

Requirement category		Requirement levels					
Tests:	**References:**	**1**	**2**	**3**	**4**	**5**	**6**
Water ([1])	EN 12720	6 h	16 h	16 h	24 h	24 h	24 h
Grease ([1])	EN 12720	24 h	24 h	24 h	24 h	24 h	24 h
Grease + scratches ([1])	SS 83 91 22	-	-	-	24 h+3 N	24 h+3 N	24 h+3 N
Scratches ([2])	SS 83 91 17	-	3 N	3 N	5 N	5 N	5 N
	alt. EN 15186. Method A ([3])	-	1,5 N	1,5 N	1,5 N	3 N	3 N
Alcohol ([1])	EN 12720	-	-	-	1 h	1 h	1 h
Coffee ([1])	EN 12720	-	1 h*	1 h	1 h	1 h	1 h
Heat, dryness ([1])	EN 12722	-	-	-	70 °C	70 °C	180 °C
Heat, moisture ([1])	EN 12721	-	-	-	-	-	85 °C
Heat on edge ([1])	NS 8061	-	-	-	-	-	85 °C
Water on edge ([1])	SS 83 91 20	-	-	1 h***	-	-	-
Sweat, acid and alkaline ([1])	EN 12720	-	1 h**	-	-	-	-

([1]) A result of 4 is pass score in the assessment. Assessment after 24 h

([2]) Maximum scratch width 0.5 mm. Penetration of the varnish layer is not acceptable.

([3]) Maximum scratch width 0.3 mm.

* Applies to storage units – external horizontal surfaces ≤ 1,250 mm above floor-level.

** Applies to armrests.

*** Applies to doors and drawer fronts.

✉ The applicant must submit a complete test report with information on which function/end use the paints or varnishes have been tested for and which standard has been used, the test institute and test result clearly showing that the requirements are fulfilled.

Background to requirement O29

Paints for use on furniture must meet the Möbelfakta criteria[82], which are the same as those in the criteria for Nordic Ecolabelled furniture generation 5 with Möbelfakta's requirement specification of 2021-11-04. As such the indoor and outdoor paints and furniture are harmonised in this requirement. The Möbelfakta criteria is a measure of how resistant the paint film is to scratches, heat, water, grease, coffee, and alcohol. The requirement levels vary depending on the intended application for the paint. For example, a paint intended for worktops needs to meet higher standards than a paint for kitchen drawer bottoms.

O30 Scratch resistance for panels and similar

Scratch resistance can be tested using the following methods or equivalent:

82 Möbelfakta: https://www.mobelfakta.se/?lng=en (visited 2022-0617)

- Scratch resistance ASTM D2794 (http://www.astm.org/Standards/D2794.htm)
- "Sheen Automatic Scratch Tester" according to EN ISO 1518-1

✉ The applicant must submit a complete test report showing that the paint/varnish has satisfactory scratch resistance for its intended purpose.

Background to requirement O30

Industrial paints for purposes other than furniture are to show their quality via a scratch resistance test. The scratch resistance of a surface is a measure of how well it stands up to impact.

O31 Abrasion/wear for surfaces subject to heavy wear, e.g., UV-cured floors and sheeting

- Floor paints, floor coatings and other products subject to an equivalent level of wear must have an abrasion resistance not exceeding 70 mg weight loss after 1000 test cycles with a 1000 g load and a CS10 wheel according to EN ISO 7784-2.
- Alternatively, a test according to EN ISO 5470-1 can be performed with 1000 test cycles with 1000 gram load and H22-wheel where the weight loss is maximum 3000 mg.

The following methods are also applicable depending on the substrate:

- Coatings must meet the scratch depth and width requirements outlined in EN 14354 for the specific coating, with no visible cracking or delamination present or,
- Coatings must have an abrasion resistance not exceeding 50 mg weight loss after 1000 test cycles with a 1000 g load and a CS10 wheel for decorative coatings, and a weight loss not exceeding 100 mg after 1000 cycles with a 1000g load and a CS17 wheel for protective coatings according to ISO 15185 or,
- Coatings must have an abrasion resistance not exceeding 0.5 g after 2000 cycles with a 1000 g load and a CS10 wheel, or not exceed 2 g after 2000 cycles with a 2000 g load with a CS17 wheel according to EN 660-2.

✉ The applicant must submit a complete test report showing that this requirement has been fulfilled in accordance with EN ISO 77842-2, EN ISO 5470-1, EN 14354, ISO 15185 or EN 660-2.

Background to requirement O31

Surfaces subject to heavy wear, e.g., floors, need to be painted/coated with paints or varnishes that are highly resistant to abrasion. One way of testing wear resistance of paints is by performing an abrasion resistance test according to EN ISO 7784-2, EN ISO 5470-1, EN 14354, ISO 15185 or EN 660-2.

O32 Water resistance for surfaces subject to heavy wear, e.g., UV-cured floors and sheeting

- Varnishes, floor coatings and floor paints shall have a resistance to water, as determined by ISO 2812-3 (Paints and varnishes – determination of resistance to liquids – Part 3: Method using an absorbent medium), such that after 24 hours' exposure and 16 hours' recovery no change of gloss or of colour occurs.

✉ The applicant shall submit a complete test report showing that this requirement has been fulfilled in accordance with ISO 2812-3.

Background to requirement O32

In addition to being resistant to abrasion, paints used on floors must also be resistant to water. Water resistance is tested in accordance with the method ISO 2812-3 Part 3: Method using an absorbent medium. This is the same method used in the EU Ecolabel criteria for indoor paints[83].

O33 Quality requirements for anti-corrosion paints

Coatings based on organic polymers cannot be Nordic Swan Ecolabelled if they are to be applied to steel structures belonging to corrosion categories C4 to CX, C3-products used for coastal areas and immersion categories Im1 to Im4, as defined in ISO 12944-6 and ISO 12944-9.

Anti-corrosion paints without zinc:

Paint systems shall be tested for corrosion according to the methods that are relevant to the purpose of the treatment, i.e., C2-C5 or Im 1-3 according to ISO 12944-6. The test must be adapted for each corrosivity category so that it corresponds to testing according to table 20 for C2-C5, alternatively table 21 for Im 1-Im 3.

If the intended use of the paint is offshore or equivalent, the coating system must meet the requirements for corrosion class CX according to EN ISO 12944-9.

If cathodic protection is to be used, the coating must pass Im 4 according to EN ISO 12944-9.

Table 20 Requirements for accelerated corrosion testing for different corrosivity.

Nordic Swan requirement	ISO 6270-1 Condensation	ISO 9227 Salt spray	ISO 12944-9 Appendix B	Corresponding classification in ISO 12944-6, -9
Corrosivity category				
C2	240	480	-	C2 VH
C3	480	720	-	C3 VH
C4	720	1440	-	C4 VH
C5	720	1440	2688	C5 H, C5 VH

Table 21 Requirements for accelerated corrosion testing for different exposure categories.

Nordic Swan requirement	ISO 2812-2 Water immersion method		ISO 6270-1 Condensation	ISO 9227 Salt spray	Corresponding classification in ISO 12944-6, -9
Corrosivity category	Fresh water	5% NaCL			
Im 1	4000	-	2160	-	Im 1 VH
Im 2, Im 3	-	4000	-	2160	Im 2-3 VH

Anti-corrosion paints containing zinc:

Zinc-containing paints are defined as paints pigmented with metallic zinc, as well as paints with zinc-based corrosion pigments, for example zinc phosphate. Metallic coatings such as hot-dip galvanizing and thermally sprayed zinc or zinc alloys are not classified as anti-corrosion paint.

For metallic zinc pigment the following applies:

83 Commision decision of 28 May 2014. https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:02014D0312-20211026&from=EN

- Metallic zinc included in the product must be of Type II or higher grade according to ASTM D520.
- Metallic zinc included in the product must consist of at least 80% of recycled zinc.

Paint systems with zinc-containing primer:

Paint systems with zinc-containing primer or middle/topcoat must pass the same tests as anti-corrosion paints that do not contain zinc, see tables 20 and 21.

Zinc-containing single-coat paints:

Zinc-containing single-layer paints must pass testing according to Table 22. The tests must be performed with scribed samples according to EN ISO 12944-9. Requirements for rust creep from scribe after testing are in accordance with Im 4, EN ISO 12944-9.

If the intended use of the paints is offshore or equivalent, the paint must also meet the requirement for corrosion class CX according to EN ISO 12944-9.

If cathodic protection is to be used, the paint must pass Im 4 according to EN ISO 12944-9.

Table 22 Requirements for accelerated corrosion testing for single-layer paints containing zinc.

Nordic Swan requirement	ISO 2812-2 Water immersion method		ISO 6270-1 Condensation	ISO 9227 Salt spray	Corresponding classification in ISO 12944-6*
Corrosivity category	Fresh water	5% NaCl			
C2	4000	4000	2160	2160	Im 1-3 VH
C3	4000	4000	2160	2160	Im 1-3 VH
C4	4000	4000	2160	2160	Im 1-3 VH
C5	4000	4000	2160	2160	Im 1-3 VH
CX	4200	4200	2160	2160	Im 1-3 VH
Im 1-3	4200	4200	2160	2160	Im 1-3 VH

** Normally these tests are performed with non-scratched panels. Testing for the Nordic Swan should be carried out with scratched panels according to ISO 12944-9.*

✉ For anti-corrosion paints containing zinc; test report for metallic zinc according to ASTM D520.

✉ Certificate from the supplier of metallic zinc showing that 80% of the zinc used in the product is recycled.

✉ Test report for anti-corrosion protection according EN ISO 12944-6, EN ISO 12944-9 or EN ISO 2812-2 depending on relevant method which clearly shows that the requirement is met.

Background to requirement O33

Test methods and standards have been chosen in consultation with the industry and with Research Institutes of Sweden (RISE). Test methods for protective coatings can be specific of the purpose of the treatment because the expected

durability of the paint depends on corrosivity, which affects public safety, durability and economy.

In general, anti-corrosion protection with a high quality and a long life span provides a surface treatment that can minimize both costs and environmental imprints from a life cycle perspective. Therefore, it is relevant to set a high-quality requirement for products to be labelled with the Nordic Swan. To reduce the environmental impact, it is important to use products that contain as low levels of harmful substances as possible that can contribute to environmental impact. The quality test for anti-corrosion paints is divided into two parts, the first part is a requirement regarding the purity of metallic zinc. In the second part of the quality requirement, it is ensured that the anti-corrosion paint maintains a sufficiently high quality for use for various purposes.

The prohibition on coatings based on organic polymers within corrosion categories C4 to CX and C3 for coastal areas and immersion categories Im1 to Im4 aligns with efforts to minimize the release of microplastics into aquatic ecosystems. The specified immersion categories Im1 to Im4 represent structures that are partially or fully submerged in water for extended periods, while corrosion categories C3 to CX either represent more aggressive environments or coastal environments. Microplastic pollution, originating from plastic-based coatings, can pose environmental risks and negatively impact marine life. By excluding coatings based on organic polymers the potential for microplastic release from coatings is reduced.

Requirement on heavy metal levels

During zinc manufacturing, impurities are often obtained from heavy metals, including lead and cadmium. The quality requirements for the purity of zinc are designed to ensure that zinc powder used contains low levels of heavy metals. Suitable test methods for determining zinc powder content may be ICP-OEMS, Atomic absorption spectroscopy or similar quantitative analysis. To ensure low levels of heavy metals, zinc powder used in anti-corrosion paints must meet the purity requirements specified for the "zinc dust type II" specification according to the US standard ASTM D520.

Recycled zinc

Metals are one of the major contributors globally to climate emissions. Metal manufacturing, including mining, is associated with significant environmental impacts related to raw material extraction, large amounts of waste, energy consumption and emissions from production. In order to reduce resource extraction and promote circular flows, it is required that a significant proportion of metallic zinc be recirculated.

Quality requirement

Test methods for anti-corrosion paints are specific to the purpose of the treatment. This is because environmental conditions and other external parameters can have a major impact on how aggressive the corrosion is. The most suitable requirements for anti-corrosion paints are found in the international standard series EN ISO 12944 where test methods for anti-corrosion paints are specified in EN ISO 12944-6 and EN ISO 12944-9.

To ensure that the anti-corrosion protection can withstand harsh conditions such as industrial areas with high humidity, aggressive atmosphere and coastal areas with high salinity, the minimum requirement is set to the highest durability classification for each corrosivity category according to EN ISO 12944-6. If the anti-corrosion protection contains zinc and is used as a single layer system, the paint system must also pass the tests of immersion category Im 1-3, where the different classifications are matched by: Im 1 (fresh water), Im 2 (salt water) and Im 3 (in soil). These tests are relevant for zinc-rich colours even if the coatings are to be used in atmospheric exposure.

These tests are relevant for zinc-rich paints even if the paints are to be used in atmospheric exposure. The tests aim to minimize the use of zinc-rich single-layer paints with active cathodic protection as well as single-layer paints pigmented with easily soluble zinc compounds as corrosion inhibitors. This group of paints are suspected to give an unnecessarily large diffuse spread of zinc (compared to the best case). The requirements are also introduced to ensure at least as good corrosion protection for eco-labelled paints.

If the anti-corrosion paint does not contain zinc, an approved result according to Im1-3 is required only if the paint is used for a protective steel that is exposed in soil or immersed in water. In connection with the above requirements, the paint must also meet the durability class Very High (VH). Durability class VH is defined as paints with durability over 25 years, where the specified time is defined as the expected time until the first major maintenance needs to be done.

If the anti-corrosion paint is to be exposed in "offshore constructions", it also applies that the paint must pass testing according to EN ISO 12944-9, corrosion class (CX) to ensure that the paint can withstand tough conditions, for example offshore constructions and industrial areas with extreme humidity and aggressive atmosphere. If the paint is used for the other purpose, for example Im4 (sea water with submerged structures with cathodic protection), then it is also relevant.

5 Requirements concerning packaging, labelling, consumer information and recycling

O34 Packaging

If the packaging material contains plastic the following requirement must be met:

- Plastic packaging must contain a minimum of 30 weight% recycled material*.

Packaging made from aluminium is not allowed for use.

Information on how the packaging should be sorted as dried or emptied must be written on the packaging (see requirement O35).

Exemption to the requirement is given for the following:

- Packaging (e.g., pouches) that amounts to less than 25 grams per litre of paint.
- For packaging ≥ 18 litres.

**Recycled material is defined in the requirement according to ISO 14021 in the following two categories:*

"Pre-consumer/commercial" is defined as material diverted from the waste stream during a manufacturing process. Excluded is reutilization of materials such as rework, regrind or scrap generated in a process and capable of being reclaimed within the same process that generated it. Nordic Ecolabelling defines rework, regrind or scrap, that cannot be recycled directly in the same process, but requires a reprocessing (e.g., sorting, reclamation and granulation) before it can be recycled, to be pre-consumer/commercial material. This is whether it is produced in-house or externally.

"Post-consumer/commercial" is defined as material generated by households or by commercial, industrial and institutional facilities in their role as end-users of the product, which can no longer be used for its intended purpose. This includes returns of material from the distribution chain.

✉ Description and documentation from plastic manufacturers showing that the plastic is recycled in compliance with the requirement's definition or has EuCertPlast certification or Global Recycled Standard certification.

✉ Calculation or statement from the packaging manufacturer showing the percentage of recycled material in the packaging.

Background to requirement O34

The impact of packaging on the environment is influenced by various factors, many related to what happens to the packaging at the end of life. Whether a paint packaging can be recycled is governed by whether the packaging is empty and dried or contains paint residue. If the packaging is empty and dried, its climate benefit is considerably increased, as it can be recycled. Recycling would be a better option for the climate compared to producing new virgin material. However, after consulting several municipal waste systems, it was found that waste plastic packaging, previously containing paint, is often sent for incineration, resulting in a considerably higher climate impact. Additionally, whether the packaging contains residue or not depends on various factors related to the consumer, user, and working environment.

To gain further insights, Nordic Ecolabel conducted a screening Life Cycle Assessment (LCA) of packaging (plastic and metal), considering scenarios involving incineration and recycling. When comparing the climate impact related to plastic and metal packaging, plastic packaging, being 100% recycled, is the most preferable option, whereas plastic packaging being 100% incinerated is the least preferable option. The climate impact related to metal packaging tends to be more in between, again with recycling being favorable to incineration.

The LCA screening did not provide a definitive answer on which packaging option is most preferable, as it depends on several factors such as whether the packaging is empty or contains residue (determining whether it is suitable for recycling), the performance of the hazardous waste incineration plant (in case of incineration) and the quality of recycled materials (in case of recycling). However, further dialogue with the industry shows that Nordic Swan cannot influence increased use of recycled material in metal packaging, as it is already industry standard to use recycled metal during production of new metal. If Nordic Swan would set higher requirement than 20% for recycled metal, it would require more fuel to increase the temperature of the furnace, resulting in increased CO2-emissions. Therefore, Nordic Swan concludes that there are currently no environmental gains that can be made for recycled metal packaging based on the limitations from the industry.

Some of the plastic used today for paint packaging consists of a certain proportion of recycled material. It is technically possible to use more than 30 weight% of recycled material in the packaging, but this requires that the recycled material is of high quality, i.e., cleaner fractions, in order for the plastic to achieve the desired properties that make it suitable as paint packaging. With a proportion of 30 weight% recycled, the plastic collected from Nordic households will be of good enough quality to be used, and this will then contribute to creating a larger market for the collected plastic. It is theoretically possible to use up to 30% recycled material, but this would compromise the technical structure of the packaging. Furthermore, by setting a requirement for 30% recycled material, the exemption for lids and handles have been removed.

There is an exception from the requirement when the packaging makes up a small proportion in relation to the amount of paint (<25 grams / liter), such as for pouches.

Furthermore, use of aluminum packaging is prohibited as, compared to traditional metal packaging for paints made from tinplate or plastic, it has a much higher climate impact.

Industrial paint and varnishes (packaging >18 liter) are exempt from the requirement because it is stored in large containers that are reused.

O35 Consumer information

The following information must be stated on the packaging. If there are any space issues, parts of the text can be moved to the technical data sheet or can be made available at the manufacturer's website with information. In addition, parts of the text can be translated into symbols.

- The purpose, substrate, and other conditions of application for which the product is intended. This shall include advice on preparation, e.g., correct preparation of the substrate or temperature.
- Estimate of “normal” coverage (e.g., l/m^2 or equivalent).
- Recommended preventive safety measures for users, such as safety equipment and ventilation (particularly when working in enclosed spaces or similar).
- The label must contain information on how the packaging should be sorted in the relevant country of sale. If the relevant country of sale has any possibility to sort the empty and dry packaging, then information must be placed on the packaging that it should be sorted as plastic or metal recycling.
- Remove the handle before sorting (only relevant if the handle is made of metal).
- Information that liquid paint and washing water with paint residues must not be emptied down the drain but delivered to an approved hazardous waste collection point.
- Recommendations on cleaning used tools and how waste products from cleaning can best be disposed of (to limit water pollution). These recommendations are to be adapted to the product types and areas of application. Pictograms may also be used where appropriate.
- Recommendations on how the product is to be stored after opening, including safety instructions where relevant.

✉ Label, product sheet or equivalent and description of how the information accompanies each product.

Background to requirement O35

Consumer information requirements have been set to facilitate the correct use of the product and to minimise the impact of the product on health and the environment. The recommendation concerning preventive safety measures has been clarified to explicitly include safety equipment and ventilation. It must be made clear what level of ventilation is required when using each type of product.

Recommendations on how to store the products after opening and how to handle residues to minimise the risk of incorrect handling is required to inform the user. Correct handling of residues and washing water is important to avoid the spread of microplastics.

Information for the user on how to use the product, on which substrates and how much product is estimated to give “normal” coverage can help to reduce waste through correct handling of the product.

6 Licence maintenance

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

O36 Customer complaints

The licensee must guarantee that the quality of the Nordic Swan Ecolabelled product or service does not deteriorate during the validity period of the licence. Therefore, the licensee must keep an archive over customer complaints.

Note that the original routine must be in one Nordic language or in English.

✉ Upload your company’s routine for handling and archiving customer complain.

Background to requirement O36

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.

O37 Traceability

The licensee must be able to trace the Nordic Swan Ecolabelled products in the production. A manufactured / sold product should be able to trace back to the occasion (time and date) and the location (specific factory) and, in relevant cases, also which machine / production line where it was produced. In addition, it should be possible to connect the product with the actual raw material used.

You can upload your company's routine or a description of the actions to ensure traceability in your company.

✉ Please upload your routine or a description.

Background to requirement O37

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.

7 Areas without requirement

A requirement for the energy production of polymers was investigated as it is an energy intensive industry for the conversion of raw material to final polymer which requires a large amount of electricity for thermal energy. Sources for the energy are mainly conventional fossil coal-based resources, e.g., coal, petrol, and natural gas and there are several improvements that could be made within the industry. This includes improvements to reduce energy intensity through energy efficient synthesis and alternative energy sources for primary energy, e.g., green hydrogen and renewable electricity.

For steerability, the project group looked at factors such as rising energy prices being of great importance in getting the polymer industry to invest in alternative energy measures. However, there are steerability issues regarding an energy requirement, as it is dependent on variables such as energy infrastructure, climate zone and ambient temperature, which differ depending on the location of production globally.

The main environmental problem described in the reference document on best available techniques in the production of polymers[84] (BAT) is primarily a focus on emissions of volatile organic compounds and waste. For energy there are general recommendations, such as increased amount of polymers in the reactors leads to energy efficiency linked to reduced downtime, which is the major energy problem. Development of the requirement concluded and was not included in this version of the criteria due to insufficient information from stakeholders and outdated information from the BAT, however, may be investigated upon in further revisions.

An energy requirement for the manufacturing plant of paints and varnishes was examined based on previous LCA-reports as described in the preliminary report of the Revision of EU European Ecolabel and Development of EU Green Public Procurement Criteria for Indoor and Outdoor Paints and Varnishes[85].

84 "Best Available Techniques for the Production of Polymers reflects an information exchange carried out under Article 16(2) of Council Directive 96/61/EC (IPPC Directive).

85 https://susproc.jrc.ec.europa.eu/product-bureau//product-groups/461/documents

Additionally, the PEFCR for paints[86] identified electricity grid for the manufacturing of paints as an impact in regard to climate change for paints. The data examined in the preliminary report showed that the activities at the manufacturing plant contributes to 25% of the paints overall environmental impact. However, the data is based upon information from a generic chemical manufacturing plant. A further investigation of this data was warranted as it could have an impact on paint manufacturing's environmental impact. By reviewing more recent EPDs from several paints and paint manufacturers, the environmental impact in terms of energy only contributed up to 5% of the total impact. Therefore, more investigation is warranted for future criteria before a requirement is included.

A requirement for microplastic emissions in the manufacturing facility of the paint and varnish and polymer production was also explored in order to reduce unintentional leakage of plastics to the waste system. Whilst high environmental, safety and quality management controls are applied throughout the plastics industry, unintentional loss of pellets can occur at different stages along the value chain and end up in the environment. For all the polymer producers it was acknowledged that they are actively members of the “Operation Clean Sweep” (OCS) initiative and are using strict processes and measures to prevent any pellet loss in our installations.

Because of the previous management controls within the industry and the initiative OCS to further take measures to prevent plastic loss, Nordic Ecolabel determined that polymer producers are already doing vast measures to prevent pellet loss through its value chain, and therefore a requirement from Nordic Ecolabel would not have enough additional potential.

For the manufacturer of paint, the main issue during the investigation was a speculation of possible plastic spill from the use of processing water used to clean the manufacturing line. Process water is taken care of in the same between all manufacturers, and it is not possible to distinguish process water between ordinary products and Nordic Ecolabelled products. Process water is often reused circularly and then sent to a remediation company where they purify the water together with water from all sorts of industries.

The customers who send process water do not analyse the water beforehand, and the remediation companies do not analyse the water. When the sanitation companies receive the water, microfiltration and reverse osmosis are used to purify the water. Microplastic ends up in the sludge that is incinerated. Based on current routines, it is not relevant to analyse for microplastics.

Thus, the requirement is already controlled via work environment legislation and if Nordic Ecolabel were to make a requirement, it would primarily be for communication purposes. The requirement is based on high relevance, low potential and low steerability.

86 https://ec.europa.eu/environment/eussd/smgp/documents/PEFCR_Decorative%20Paints_Feb%202020.pdf

8 Changes compared to previous generation

Table 23 Overview of changes to criteria for Paints and Varnishes generation 4 compared with previous generation 3, and Chemical Building Products (Outdoor and Industrial Paints and Varnishes) compared with previous generation 2.

Overview of changes compared to previous versions of the respective criteria					
Proposed requirement generation 4	**Requirement generation 3 / 2**	**Same req.**	**Change**	**New req.**	**Comment**
Product definition	O1		X		Products which primary function is not to form a film over the substrate, e.g., oils are now within the scope of the criteria.
O1 Information of the product	O1	X			
O2 Classification of the product	O2		X		EUH208 restriction has been removed.
O3 Classification of ingoing substances	O3		X		Time-limited exemption added for trimethylolpropane. Bisphenol A exemption is now clarified for the final epoxy paint.
O4 Environmentally harmful substances	O4		X		Indoor wall and ceiling paints now have a separate limit value of 6%. Other indoor paints and varnishes, outdoor- and industrial paints and varnishes have a limit value of 8%. Zinc oxide used as stabilizer is now exempted from the calculation up to 2500 ppm.
O5 Preservatives	O5		X		Limit of total preservatives lowered for outdoor paints. Isothiazolinone limit changed to 500 ppm. DBNPA clarified to be exempted from calculation of total preservatives.
O6 Formaldehyde	O6		X		Formaldehyde emission testing for indoor paints and varnishes. In-can testing indoor and outdoor set to 25 ppm.
O7 Residual monomers in polymers	O7		X		Limit of vinyl acetate monomer lowered to 700 ppm.
O8 Heavy metals	O8	X			
O9 Titanium dioxide			X		Energy related requirements added for the manufacturer.
O10 Powdered raw materials		X			
O11 Nanomaterials	O11		X		New definition.
O12 Prohibited substances	O12		X		EU's priority list for potential endocrine disrupters has been replaced by the EU member state initiative "Endocrine Disruptor Lists", List I, II and III. DBNPA is exempted in all forms used in the production of paints and varnishes or used as an in-can preservative in raw materials or paints and varnishes.
O13 Emissions of Volatile and Semi-Volatile Organic in indoor paints and varnishes				X	Emission tests requirement according to EN 16516.

Overview of changes compared to previous versions of the respective criteria					
Proposed requirement generation 4	**Requirement generation 3 / 2**	**Same req.**	**Change**	**New req.**	**Comment**
O14 Content of Volatile and Semi-volatile Organic Compounds in paints and varnishes	O20[2]		X		Requirement now includes both indoor and outdoor paints and varnishes. Requirement for content of ready-to-use SVOC added to outdoor paints and varnishes. Limit for anti-corrosion paints increased to 75 g/L.
O15 Volatile Aromatic Compounds		X			
O16 Acrylic and alkyd resin binders				X	Policy requirement for renewable raw materials.
O17 Cement/Hydraulic binder				X	EPD and requirement and GWP-limit for different types of hydraulic binders.
O18 Claims for Wet Scrub Resistance	O16[3]	X			
O19 White pigment content	O15[3]	X			
O20 Spreading rate	O17[3]	X			
O21 Resistance to water	O18[3]	X			
O22 Adhesion	O19[3]	X			
O23 Abrasion	O20[3]	X			
O24 Weathering test for outdoor paints and varnishes	O23[2]		X		Updated standards. Previous requirement O23[2] has broken up into several requirements, applies to new O25-O29. Wood oils are required to be tested according to EN 927-6 for 5 weeks. Varnishes, bases and wood oils exempted from requirement of colour change. Wood oils are exempted from the requirement in decrease in gloss.
O25 Water vapour permeability for masonry paints for outdoor use	O23[2]		X		
O26 Liquid water permeability for masonry paints for outdoor use	O23[2]		X		
O27 Fungal growth	O23[2]		X		
O28 Powder paints and varnishes for outdoor use	O23[2]		X		
O29 Quality requirements for industrial paints and varnishes for furniture	O25[2]	X			
O30 Scratch resistance for UV-cured floors, panels and similar	O26[2]	X			
O31 Abrasion/wear for surfaces subject to heavy wear, e.g., UV-cured floors and sheeting	O27[2]		X		Following alternative methods have been added depending on substrate: EN 14354, ISO 15185, and EN 660-2.
O32 Water resistance for surfaces subject to heavy	O28[2]	X			

Overview of changes compared to previous versions of the respective criteria					
Proposed requirement generation 4	**Requirement generation 3 / 2**	**Same req.**	**Change**	**New req.**	**Comment**
wear, e.g., UV-cured floors and sheeting					
O33 Quality requirements for anti-corrosion paint for industry and infrastructure	O32[2]		X		Requirement has been changed to include coatings for other corrosivity categories, i.e., C2-C4 while requiring high durability for their respective use. Requirement has been changed to prohibit anti-corrosion paints based on organic polymers if used for corrosion categories C4-CX and C3-coastal areas and immersion categories Im1-Im4. Requirement has been added for recycled zinc in anti-corrosion paints that contain zinc.
O34 Packaging	O22[3]/O33[2]			X	Requirement for 30% recycled material in plastic packaging.
O35 Consumer information	O21[3]/O35[2]		X		Information on how the packing can be sorted.
O36 Customer complaints	O27[3]/O41[2]		X		
O37 Traceability	O30[3]/O44[2]		X		

[2] Generation 2 Chemical building Products (outdoor- and industrial paints and varnishes)
[3] Generation 3 Indoor Paints and Varnishes

9 New criteria

- Determine environmental gains with energy requirement for polymer producers.
- Determine environmental gains with energy requirement for paint manufacturer.
- Evaluate the possibility of stricter requirement for biobased binders.
- Determine possible environmental gains with requirement to SVOC (Semi-Volatile Organic Compounds) in industrial paints and varnishes.