About Nordic Swan Ecolabelled

# Chemical Building products

Version 3.1 • 02 December 2024 – 02 December 2029

Nordic Ecolabelling

# Content



097 Chemical building products, version 3.1, 25 February 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
info@ecolabel.dk
www.svanemaerket.dk

**Iceland**
Ecolabelling Iceland
svanurinn@uos.is
www.svanurinn.is

**Finland**
Ecolabelling Finland
joutsen@ecolabel.fi
https://joutsenmerkki.fi

**Norway**
Ecolabelling Norway
info@svanemerket.no
www.svanemerket.no

**Sweden**
Ecolabelling Sweden
info@svanen.se
www.svanen.se

# 1 What to communicate about a Nordic Swan Ecolabel Chemical building product

A Nordic Swan Ecolabel chemical building product has reduced environmental impact throughout its lifecycle. By meeting strict requirements for chemicals, quality and raw materials, the product group is a better choice for the environment, the climate, and the users.

Nordic Swan Ecolabel chemical building products:

- Meet strict quality requirements to promote long-lasting, durable, and efficient chemical building products which leads to less use of resources in a lifecycle perspective.
- Meet strict requirements regarding environmentally hazardous chemicals.
- Meet strict health requirements for chemicals, such as strict requirements to substances that are classified to cause cancer, damage genes or reproductive capacity.
- Is free from phthalates, organic fluorinated substances and identified and potential endocrine disruptors on current lists from EU and national authorities.
- Meet strict requirements for emissions of harmful substances. This is positive for the indoor environment.
- Meet requirements for the manufacturing of raw materials with high climate impact such as titanium dioxide and cement/hydraulic binders.
- Has packaging that includes recycled plastic - which contributes to a circular economy.
- Ensures that if renewable raw materials are used, it originates from more sustainably produced and controlled sources.

The overall environmental impact in the lifecycle of this product group and Nordic Swan Ecolabel identification of where ecolabelling can have the greatest effect is described in Chapter 6 Environmental impact of the chemical building product.

# 2 What can carry the Nordic Swan Ecolabel?

The product group of chemical building products shall comprise of the following:

- Adhesives, including multipurpose adhesives/construction adhesives*
- Sealants
- Fillers, putty, levelling compound (screed) (including primers to these)

- Impregnating agent for tiles, stone, and concrete**
- Mortars and plasters (including primers to these)

* *Here adhesives refer to products such as wood adhesive, grab adhesive, tile adhesive, wallpaper paste and the like. The product group does not include adhesives for industrial use for purposes such as furniture production or panelling.*

** *Impregnating agents for tiles, stone and concrete refer to products that have special technical properties that protect the material.*

# 3 Summary

Nordic Swan Ecolabelling holds significant relevance for a range of chemical building products, including putties, fillers, adhesives, sealants, impregnating agents, mortars and plasters. Sustainable practices in this domain have evolved to address diverse environmental aspects. Companies now prioritize reducing volatile organic compounds (VOCs), conserving energy, minimizing waste, enhancing process efficiency, and incorporating renewable materials. The evaluation of social impacts across the entire value chain is increasingly integral, reflecting a broader commitment to environmental sustainability and social responsibility in the production and use of chemical building products.

### 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 has been tightened. In addition, new CLP classifications have been added to better identify endocrine disruptors, persistent substances, and mobile and toxic substances.

In this generation of chemical requirements, a definition of ingoing substances is used which means a ban on specific ingoing substances 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.

### 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.

It is difficult to measure the environmental gains from ecolabelling. Nordic Ecolabelling is, however, aware that the licensees in this product group have widely been forced to change their formulations in order to meet the requirements set out in the Criteria for Nordic Ecolabelling of Chemical Building Products. This fact, coupled with the relatively large volumes of chemical building products, gives a strong indication that a significant environmental gain has been generated.

# 4 Requirements and justification of these

Nordic Ecolabelling bases its work on three parameters when setting the requirements within the criteria.

These three parameters are to be seen together and as such are referred to as Relevance-Potential-Steerability, RPS. Choosing the requirements that together have the greatest relevance, potential and steerability in terms of the product's life cycle achieves the greatest environmental gain.

**Relevance** is assessed based on which environmental problems the product group causes and how extensive those problems are.

**Potential** is assessed based on the potential environmental gains within the specific product group and for each area in the criteria where requirements are set.

**Steerability** is assessed based on the scope to set requirements concerning the relevant environmental parameters with potential for improvement.

These chapters also present new and revised requirements, explains the background to them, the chosen requirement levels and any changes compared with previous generation for chemical building products. The appendices referred to are those that appear in the criteria document.

# 5 General requirements

### Background to requirement O1 Information about the product

The purpose of this requirement is to give an overview of the chemical building product that is to be certified with the Nordic Swan Ecolabel and that the product falls within the product definition.

# 6 Chemical requirements

### Background to requirement O2 Classification of the product

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

An exemption for SMP adhesives and SMP sealants classified as H412 if the classification is due to an antioxidant was introduced to ensure they maintain durability in outdoor use. Without UV protection, these products break down faster, leading to shorter lifespans and increased material use. To limit environmental impact, the exemption only applies to antioxidants with water solubility $\leq 0.10$ mg/L, making leaching negligible. Since the products are applied with a sealant gun and do not require water for cleaning, the risk of release into the environment is minimal.

### Background to requirement O3 Classification of ingoing substances

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 reapplying periods are reduced.

For background information on the new CLP-classifications, see background for requirement O2.

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 a dispersion, 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.

### Background to requirement O4 Environmentally harmful substances

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 from previous 11% to 8% based on licensing data, mainly due to the removal of outdoor paints and industrial paints from the criteria which contributed to the previous limit value.

Zinc oxide (ZnO) is a multifunctional component in various formulations for general building products, functioning as a UV-blocker, opacity brightener, and an inhibitor of microorganism growth such as bacteria and fungi, which can compromise the contents of the product. The absence of ZnO can lead to a reduction in the product's lifetime and shelf life. Preservative-free formulations for building products rely on alternative strategies like pH and moisture control, as well as careful raw material selection. However, ZnO also plays a role in preventing microbial growth, reducing the reliance on additional preservatives that might have adverse environmental effects. Incorporating ZnO as an antimicrobial agent in building products can extend their shelf life and decrease the need for other preservatives.

The exemption for antioxidants in SMP adhesives and SMP sealants is described in O2.

### Background to requirement O5 Preservatives

Preservatives are added to liquid products to prevent bacterial growth in the products, in-can preservatives. The composition of the product may also affect the need for preservatives. The product's durability and longevity are currently the largest gains that can be made in regard to circular economy, although an increased exposure to isothiazolinones is seen as a risk.

Since binders (the raw materials that contain most isothiazolinones) used in acrylic sealants are also often the same as in adhesives, it makes most sense to set similar requirements for adhesives and sealants when it comes to preservatives.

However, sealants are predominantly used in guns/applicators that reduce skin contact, and it is therefore reasonable for the limit to be the same as for adhesives. Many sealants come with a recommendation that a finger can be used to finish the sealant. However, this can also be done using a sealant smoother, or a damp sponge or cloth. See requirement O34 on consumer information and recommendations.

Fillers and indoor paints are similar because they both use polymers and include natural materials that add microorganisms to the product. The 500 ppm limit for isothiazolinone compounds uses the same limit value as what is needed for indoor paints in the criteria of Paints and Varnishes version 4.0.

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.

Impregnating agents for tile, stone and concrete, requirements have been changed from previous version to allow for more diverse use of impregnating agents, for instance impregnation for concrete. Furthermore, the requirement has been harmonized with other product types such as adhesives and sealants.

### Background to requirement O6 Formaldehyde

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 and outdoor products.

For indoor products, 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 products, the requirement is similar as to the previous generation of the criteria.

To minimising the costs to applicants for multiple products within the same product series, the formaldehyde content or emission shall be determined for the product that is predicted to contain the highest theoretical amount of formaldehyde.

### Background to requirement O7 Residual monomers in polymers

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 4 is based on licensing data.

Vinyl acetate is used in polymer dispersions in certain products. 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 1000 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.

### Background requirement to O8 Heavy metals

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[1]. 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[2]. 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[3]. Chromium VI is classified as: very toxic, CMR and harmful to the environment.

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 chemical building products 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 sulfate (and other equally insoluble barium compounds) is used in fillers in chemical building products and are exempted from this requirement since there are not many other alternatives available with the same function. Pigments containing Barium sulphate are exempt from testing.

Note that selenium is not a metal but a metalloid which means it has some metallic properties and some non-metallic properties, 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.

The specific natural occurring raw material for plasters and mortals may contain more lead than can be commonly found in other mineral raw materials due to

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

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

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

process-related impurities, therefore the requirement is different compared to the other products.

### Backgroud requirement to O9 Titanium dioxide

For chemical building products, the use of titanium dioxide may be less compared to paints and varnishes, where titanium dioxide plays an important part in the overall lifecycle of a paint or varnish. However, chemical building products can still contain titanium dioxide due to its use as a white pigment, providing brightness and opacity e.g., in fillers, or providing benefits such as UV resistance and improving the overall durability of the product. The production of titanium dioxide pigments involves energy-intensive processes, and the production is associated with environmental impact, however it is important in enhancing the performance of the product. A carefully balanced approach is needed in order to ensure that high quality products 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[4].

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.

The production of titanium dioxide is also associated with emissions of sulphates, $SO_2$ and chloride[5]. 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 has been included in requirement of powder (O10) handling due to the inherent classification of titanium dioxide as suspected carcinogen through inhalation. Therefore, to ensure that the $TiO_2$ risks that give rise to its classification are controlled, an assessment of the process and procedures on the handling and conditions of $TiO_2$ in powder form regarding to the occupational safety and health needs to be documented by the raw material producer to reduce worker exposure to dust.

[4] Middlemas et al., (2015) Life cycle assessment comparison of emerging and traditional Titanium dioxide manufacturing processes
[5] Best Available Techniques for the Production of Basic Inorganic Chemicals (BREF) (August 2007).

## Background requirement to O10 Powdered raw materials

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 chemical building products.

Respirable crystalline silica/quartz is present as an impurity in most mineral fillers and is therefore commonly used in chemical building products. It is classified as STOT RE 1 (see O3), but when it is mixed into the wet product 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.

## Background requirement to O11 Nanomaterials/-particles

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.[6,7,8,9,10,11,12,13,14]

[6] 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
[7] 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
[8] 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.
[9] 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
[10] 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
[11] 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
[12] SweNanoSafe. Nationell plattform för nanosäkerhet. https://swenanosafe.se/ (visited 2022-06-07)
[13] BEUC – The European Consumer Organisation. Nanotechnology. www.beuc.eu/safety/nanotechnology (visited 2022-06-07)
[14] 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

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.[15]

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.[16] 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.[17] In the future, other types of engineered nanomaterials are expected to come onto the market.[18]

In the product group of chemical building products, it is hard to formulate requirements to the content of nano particles. Chemical building 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 chemical building products consists of particles in nano size which are referred to as nano materials according to the EU commission's definition. 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. In general, we prohibit nanomaterials based on the precautionary principle. However, several nano-sized traditional chemical building 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)[19]. 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 nanomaterial that is added to give the products new properties, such as a self-cleaning effect in chemical products. These are not exempted from the requirement and therefore must not be used in Nordic Ecolabelled chemical building products.

[15] 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
[16] 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
[17] 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
[18] 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
[19] 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

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

Traditional fillers are permitted. Naturally occurring fillers from for example chalk, marble, dolomite and lime are exempted from registration according to appendix V, point 7 in REACH, see below, as long as these fillers only are physically processed (milled, sieved and so on) and not chemically modified. They are also exempted from registration in the Danish Environmental Protection Agency's draft to the Order on a register of mixtures and articles that contain nanomaterials and the requirement for producers and importers to report to the register.[20]

In REACH directive (1907/2006/EF[21]) it is in article 2, point 2, point 7b:

"The following shall be exempted from Titles II, V and VI: (Title II covers the registration of substances, Title V covers downstream user and Title VI covers evaluation) (b) substances covered by Annex V, as registration is deemed inappropriate or unnecessary for these substances and their exemption from these Titles does not prejudice the objectives of this Regulation;"

Annex V Exemptions from the obligation to register in accordance with article 2(7)(b):

"The following substances which occur in nature, if they are not chemically modified. Minerals, ores, ore concentrates, cement clinker, natural gas, liquefied petroleum gas, natural gas condensate, process gases and components thereof, crude oil, coal, coke."

Synthetic amorphous silica (SAS) is an intentionally manufactured silicon dioxide (SiO2) form that has been used in industrial, consumer and pharmaceutical products for decades.[22] SAS is a nanomaterial, under the European Commission definition[23] and is exempted from the requirement due to a lack of alternative substances.

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

[20] Link to Miljøstyrelsens consultation: http://hoeringsportalen.dk/Hearing/Details/16910 (visited 20/1-14)
[21] Link to REACH-directive: http://eur-lex.europa.eu/LexUriServ/site/en/oj/2006/l_396/l_39620061230en00010849.pdf
[22] https://www.asasp.eu/images/Publications/Nano_-_SAS_factsheet_-_201209.pdf
[23] COMMISSION RECOMMENDATION of 18 October 2011 on the definition of nanomaterial (2011/696/EU)

unmodified PCC would have a higher toxicity than GCC as it has been evaluated in EU.[24]

Polymer dispersions can technically fulfil the nanomaterial definition. The EU Commission has recommended that solid nanomaterials dispersed in a liquid phase (colloidal) should be considered as nanomaterials.[25,26,27] Non-solid (i.e. liquid and gaseous) particles are excluded from the definition.

Nano emulsions are not covered by the definition because they consist of liquid nano-objects suspended in a liquid phase and the term "particle" is intended to cover only solid nano-objects.[28] Polymers exist in different phases and distinguishing between liquid, semi-solid and solid polymers can be very difficult. To treat all dispersed and suspended polymers alike and avoid confusion, we explicitly state that polymer dispersions are exempted from the requirement. However, some polymer dispersions will still be excluded from Nordic Swan Ecolabel products because they are covered by a restriction on microplastics or by other chemical requirements.

### Background requirement to O12 Prohibited substances

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

**REACH Candidate list of SVHC:**

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:**

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

[24] https://efsa.onlinelibrary.wiley.com/doi/10.2903/j.efsa.2022.7135
[25] European commission, COMMISSION STAFF WORKING PAPER, Types and uses of nanomaterials, including safety aspects, SWD(2012) 288 final.
https://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=SWD:2012:0288:FIN:EN:PDF
[26] 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.
https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52012DC0572
[27] 43 EU Commission recommendation on the definition of nanomaterial (2022/C 229/01)
https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32022H0614(01)&from=EN
[28] 44 European commission, COMMISSION STAFF WORKING PAPER, Types and uses of nanomaterials, including safety aspects, SWD(2012) 288 final.

adverse characteristics they pose a threat to the environment and human health. They are prohibited in all Nordic Swan Ecolabel products.

**Endocrine disruptors:**

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.

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.

**Organotin compounds:**

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[29], 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 chemical building products, such as endocrine disrupting and environmentally hazardous, see more below.

An exemption for organotin compounds in SMP sealants and SMP adhesives was introduced because they are essential for achieving the required elasticity and adhesion. No suitable alternatives exist, and without them, the products would not meet CE marking standards. To minimize their use, the exemption is limited to < 1000 ppm (<0.1% by weight) in the final product, ensuring only the necessary amount is allowed while meeting all other requirements in O12.

**Phthalates:**

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.

**Bisphenols:**

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[30] substances were identified in need for further regulatory risk management in EU[31].

**APEO:**

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

[29] http://www2.mst.dk/udgiv/publikationer/2010/978-87-92617-15-6/pdf/978-87-92617-16-3.pdf
[30] 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
[31] Annex XV restriction report https://echa.europa.eu/documents/10162/450ca46b-493f-fd0c-afec-c3aea39de487

alkylphenols are included in the Candidate List due to endocrine disrupting properties.

**Perfluorinated and polyfluorinated alkylated substances (PFAS)**

Perfluorinated and polyfluorinated alkylated substances (PFAS) are a group of substances with undesirable properties. PFASs are defined as fluorinated substances containing at least one fully fluorinated methyl or methylene carbon atom (without any H / Cl / Br / I atom attached to it), i.e., with a few listed exceptions, all chemicals with at least one perfluorinated methyl group ($–CF_3$) or a perfluorinated the methylene group (–CF2–) is a PFAS as described in OECD 2021.[32] 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.

**Halogenated organic substances:**

Halogenated organic substances whereas organic substances that contain halogenated substances such as chlorine, bromine, fluorine, or iodine must not appear in Nordic Swan Ecolabelled chemical building products. 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 chemical building products. This means that substances such as brominated flame retardants, chlorinated paraffins, perfluoroalkyl compounds and certain plasticisers are not permitted in Nordic Swan Ecolabelled chemical building products.

There are also halogenated pigments used in the 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 chemical building products. 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.

[32] https://www.oecd.org/chemicalsafety/portal-perfluorinated-chemicals/terminology-per-and-polyfluoroalkyl-substances.pdf 2021

**Isocyanates:**

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[33]. 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 used in water-based adhesives, 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 adhesives are applied.

**Fragrances:**

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

**Boric acid, borates, and perborates:**

Boric acid, borates and perborates have many uses and can be used in adhesives and sealants. They are also classified as toxic to reproduction and poses a risk to consumers.

**EDTA and DTPA:**

Ethylenediaminetetraacetic acid (EDTA) and diethylenetriamine pentaacetate (DTPA) can be used in sealants, adhesives, fillers, putties and plasters to improve stability. EDTA, DTPA and their salts are not readily degradable. Furthermore, they are both classified toxic for reproduction and poses a risk to consumers. for EDTA, the EU's risk assessment states that under the conditions at municipal water treatment plants EDTA is either not broken down or only breaks down to a slight degree. To-date in Europe, EDTA has been replaced in virtually all consumer products by readily biodegradable alternatives such as MGDA (methylglycine diacetic acid) and GLDA (glutamic acid diacetic acid). To address stakeholder by having a new substance requirement in the prohibited list, the allowed limit value is 0,1% in the final product.

[33] RAC Opinion on scientific evaluation occupational exposure limits for Diisocyanates. 11 June 2020. https://echa.europa.eu/documents/10162/4ea3b5ee-141b-63c9-8ffd-1c268dda95e9 (Accessed on 2022-11-15).

# 7 Binder requirements

## Background to requirement O13 Acrylic and alkyd resin binders

### Acrylic resins

This is a new requirement in generation 3 of the criteria and the same requirement in the criteria of paints and varnishes generation 4. Implementing a supply chain policy and code of conduct for responsible sourcing of renewable raw materials is important for the license holder of chemical building products. 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 chemical building products. 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 chemical building products 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[34]. 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-

[34] Amelia, Okta, et al. (2021) Eco-friendly Alkyd Resins Based on Vegetable Oil. Jurnal Rekayasa Proses.

based products. For example, the agricultural process has a large impact on the sustainability of vegetable oils[35]. The environmental impact of raw materials can 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.

[35] Alcock. Thomas et al. (2022): More sustainable vegetable oil: Balancing productivity with carbon storage opportunities

## Background to requirement O14 Cement/Hydraulic binder

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[36]. 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[37].

Given this substantial environmental footprint, it is necessary to set requirements that effectively reduce energy demand and limit $CO_2$ emissions[38]. 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[39] 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[40]. 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 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

[36] The Cement Sustainability Initiative: https://docs.wbcsd.org/2016/12/GNR.pdf (visited 2022-05-30)
[37] 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.
[38] 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
[39] https://cembureau.eu/media/dnbf4xzc/activity-report-2023-for-web.pdf
[40] $CO_2$ and Energy Accounting and Reporting Standard or the Cement Industry, Version 3.0 (2011)

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.

# 8 Adhesives, multipurpose adhesives, and construction adhesives

### Background to requirement O15, O19, O23, O27 and O31 Volatile aromatic compounds (VAC)

VACs have specific environmental and human health impacts including DNA damage[41]. 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.

### Background to requirement O16, O20, O24, O28 and O32 Volatile organic compounds (VOC)

Volatile organic compounds (VOCs) are to be considered particularly concerning due to their inherent properties. They can be absorbed through the lungs and skin and cause damage to various organs. Prolonged exposure to certain organic solvents can cause chronic damage to the brain and nervous system, while other organic solvents can cause cancer or reproductive damage[42]. The requirement concerning adhesives has been set such that adhesives that need to be frostproof are permitted to contain up to 6.0% by weight volatile organic compounds, so that they can function at low temperatures. Other adhesives are permitted to contain no more than 1.0% by weight volatile organic compounds.

### Background to requirement O17 Emission of total volatile organic compounds (TVOC) and total semi-volatile organic compounds (TSVOC) in adhesives

The requirement for emissions has slightly changed from previous version to align with emission testing in accordance with requirements set out in the EU-Taxonomy as well as the EMICODE + and other certifications such as Blauer Angel. Carcinogenic VOCs has been included in the requirement to be in line with the EU-Taxonomy.

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[43,44]. As people spend

41 Environ Health Perspect. 2002 June; 110(Suppl 3): 451–488.
42 Bruckner, J. V., Anand, S. S., & Warren, D. A. (2008). Toxic effects of solvents and vapors. Casarette and Doull's Toxicology: The Basic Science of Poison, 7th Ed. Klaassen CD (Eds.), 981-1051.
43 Swedish Chemicals Agency (KemI). Action plan for an non-toxic everyday 2015–2020 – protect the children (in Swedish). Report 5. KemI, Sundbyberg, 2014.
44 Sundell J. (2004) On the history of indoor air quality and health.

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[45]. 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[46]. 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 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[47] has an optional criterion[48] that SVOCs need to be avoided within the sector[49]. Indoor SVOCs originate from indoor and outdoor sources. The major issue is that SVOCs can partition themselves among different phases and available surfaces[50], walls and onto other surfaces which increases their residence time indoors to several years. SVOCs may also react with indoor oxidants, such as hydroxyl radicals (OH), nitrate radicals ($NO_3$), and ozone, as such, they can be inhaled and ingested and pose a risk to health and environment[51]. SVOCs are not subjected to a limit but is to be reported in the requirement.

### Background to requirement O18 Quality requirements for adhesives

Adhesives are tested in line with the test methods stated in the requirement in order to show that the products meet the quality standards in the tests. An adhesive that performs well stops the user having to use unnecessary amounts of the product and this can "save" on raw materials compared with less good adhesive, where gluing must be done several times to achieve the same effect. Test methods have been chosen in dialogue with the industry.

## 9 Sealants

### Background to requirement O19 Volatile aromatic compounds (VAC)

See background for requirement O15 for background information.

### Background to requirement O20 Volatile organic compounds (VOC)

See background for requirement O16 for background information.

[45] 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.
[46] Weschler, C. J., & Nazaroff, W. W. (2008). Semivolatile organic compounds in indoor environments. Atmospheric environment, 42(40), 9018-9040.
[47] Council Directive 89/106/EEC
[48] European Collaborative Action. Urban air, indoor environment, and human exposure. Report No 27; Harmonisation framework for indoor material labelling schemes in the EU (2010)
[49] CEN/TC 351 Construction products: Assessment of the release of dangerous substances.
[50] 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.
[51] Salthammer, T et al., (2009) Occurrence, Dynamics, and Reactions of Organic Pollutants in the Indoor Environment

### Background to requirement O21 Emission of total volatile organic compounds (TVOC) and total semi-volatile organic compounds (TSVOC) in sealants

See background for requirement O17 for background information.

### Background to requirement O22 Quality requirements for sealants

The quality of the sealant is to be tested in accordance with ISO 11600. To ensure that it is possible to test sealant quality, an alternative to the standardised test method is given in the form of a comparative test that clearly shows the quality of the sealant. In drawing up the first version of the criteria, Nordic Ecolabelling contacted various suppliers and reviewed product sheets and MSDS to determine the standardised method and to allow for a comparative test.

## 10 Fillers, putty and levelling compound (screed)

### Background to requirement O23 Volatile aromatic compounds (VAC)

See background for requirement O15 for background information.

### Background to requirement O24 Volatile organic compounds (VOC)

See background for requirement O16 for background information.

### Background to requirement O25 Emission of total volatile organic compounds (TVOC) and total semi-volatile organic compounds (TSVOC) in fillers

See background for requirement O17 for background information.

### Background to requirement O26 Quality requirements for fillers, putty and levelling compounds (screed)

Under the requirement, the manufacturer has to describe how the filler has been tested to ensure good, consistent quality with a special focus on: viscosity, adhesion, gap-filling properties, shrinkage, minimal sinking and durability. Tests of filler for plasterboard must be conducted in accordance with the standard EN 13963. Other fillers are to be tested in accordance with EN 15824 or other relevant harmonised standards. The products can also be tested with a comparative test that clearly shows the quality of the filler.

## 11 Impregnating agents for tile, stone, and concrete

### Background to requirement O27 Volatile aromatic compounds (VAC)

See background for requirement O15 for background information.

### Background to requirement O28 Volatile organic compounds (VOC)

The requirement has been changed from previous version as it was expanded to include impregnating agents for concrete indoors. Requirement for VOC has been set to similar values as other product groups concerning indoor exposure of VOC. In the previous requirement, VOC was not listed with a limit value, therefore being set to the standard impurity limit and thus the requirement has been eased compared to the previous version.

### Background to requirement O29 Emission of total volatile organic compounds (TVOC) and total semi-volatile organic compounds (TSVOC) in impregnating agents for tile, stone and concrete

See background for requirement O17 for background information.

### Background to requirement O30 Quality requirements for impregnating agents for tile, stone and concrete

Test methods and pass levels have been chosen in dialogue with the industry. Test method EN 13892-4 tests the wear resistance on e.g. cement surfaces. Resistance is measured in unit AR, which is the average depth of wear in µm. The AR classes are AR 5.0, AR 1, AR 2, AR 4 and AR6. The lower AR value the better the wear resistance. The requirement level is set minimum AR 1, so that the Nordic Ecolabelled impregnating agents for tile, stone and concrete have a good quality and efficiency. There are no other relevant international test methods available. Possible claims must be proven with an appropriate test method in relation to the claimed effects, e.g. to reduce coatings and fouling. Testing must show that the product has the claimed effect and is documented by describing the test method, results, and photo documentation.

## 12 Mortar and plaster

### Background to requirement O31 Volatile aromatic compounds (VAC)

See background for requirement O15 for background information.

### Background to requirement O32 Volatile organic compounds (VOC)

See background for requirement O16 for background information.

### Background to requirement O33 Emission of total volatile organic compounds (TVOC) and total semi-volatile organic compounds (TSVOC) in internal plasters and mortars

See background for requirement O17 for background information.

### Background to requirement O34 Quality requirement for mortars and plasters

Nordic Ecolabelling has included mortars and plasters in the criteria, making sure they meet specific quality standards as with previous product groups. Setting these requirements aligns with promoting sustainable construction practices.

EN 1015 and EN 998 has been chosen as testing standards. EN 1015 covers various properties like consistency, strength, and durability of mortars. On the other hand, EN 998 specifically addresses rendering and plastering mortars, giving clear criteria for their composition and performance.

The limit values have been set to act as important benchmarks, while having considerations in terms of durability, performance, and environmental aspects. Compressive strength has been set in order to limit the amount of binder needed for national architectural purposes, as increased compressive strength can result in increased $CO_2$ of the product from a life cycle perspective.

# 13 Requirements concerning packaging, labelling, consumer information, and recycling

### Background to requirement O35 Packaging

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 chemical building product packaging can be recycled is governed by whether the packaging is empty and dried or contains 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.

Some of the plastic used today for chemical building products 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 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 50% recycled material, but this would compromise the technical structure of the packaging.

Furthermore, use of aluminium packaging is prohibited as, compared to traditional metal packaging made from tinplate or plastic packaging, it has a much higher climate impact. However, a few exemptions have been added as to where aluminium cannot be replaced due to technical reasons if the packaging is less than 25 grams per litre product. Cartridges for sealants and soft-tubes in plastic has also been exempted as these packaging would become heavier if they would be made of recycled plastics which could affect the work load of the construction. Additionally, the material would become grey which would prevent printing on the cartridge, which would result in excess labels being made just for that purpose.

### Background to requirement O36 Consumer information

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.

# 14 Licence maintenance

### Background to requirement O37 Customer complaints

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

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

### Background to requirement O38 Traceability

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

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

# 15 Environmental impact of the chemical building products

The criteria for Nordic Swan Ecolabel chemical building products are based on the principles of life cycle assessment and RPS[52] (Relevance, Potential and Steerability) analysis. Additionally, parts of the criteria for paints and varnishes have been used as a reference due to the similarity of raw materials used.

## 15.1 RPS-analysis

This product group was set up on the basis of experiences that Nordic Ecolabelling had of ecolabelling houses, which led to an evaluation of Relevance, Potential and Steerability for chemical building products being developed in 2004.

To achieve environmental gains, each individual requirement must be relevant to the environmental objectives of Nordic Ecolabelling[53]. There must also be a proven potential to differentiate between the environmentally better products and others (there must be a difference, and it has to be large enough that it "pays" to set the requirement). There must also be scope to steer the environmental problem in question via ecolabelling requirements. These three parameters are to be seen together and as such are referred to as Relevance-

[52] https://www.nordic-ecolabel.org/nordic-swan-ecolabel/criteria-process/rps-tool/
[53] https://www.nordic-swan-ecolabel.org/nordic-ecolabelling/environmental-aspects/

Potential-Steerability, RPS. Choosing the requirements that together have the greatest relevance, potential and steerability in terms of the product's life cycle achieves the greatest environmental gain.

Experiences from the licensing work were drawn on in combination with a light RPS, and a MECO analysis (which looks at the combined impact of materials, energy, chemicals and other aspects such as waste, transport and so on) was conducted as part of the assessment of the product group in 2012. Furthermore, parts of the RPS and MECO that were developed for paints and varnishes version 4.0 have been used in the criteria development for chemical building products. The conclusion was that this remains a highly relevant product group for which to set ecolabelling criteria.

The MECO analysis showed that the key parameter for chemical building products is the properties of the constituent substances.

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 = Medium<br>P = High<br>S = High | Titanium dioxide has a large environmental impact if it used as a raw material in the product, while being an important part for the performance of the formulation. There is a high energy demand[54] 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[55] and energy emissions.<br><br>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[56].<br><br>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<br>P = High<br>S = High | Traditional chemical products are derived from synthetic polymers, and as the production of chemical building products 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.<br><br>Also, the manufacture of biobased polymers is of high relevance[57,58]. 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. |

[54] https://iopscience.iop.org/article/10.1088/1757-899X/678/1/012113/pdf
[55] Environmental Impact of Coated Exterior Wooden Cladding - Hakkinen et al, VTT Building Technology, 1999
[56] 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.
[57] Michel Biron, in Thermoplastics and Thermoplastic Composites (Third Edition), 2018
[58] https://www.european-bioplastics.org/how-much-land-do-we-really-need-to-produce-bio-based-plastics/

| | | |
|---|---|---|
| | | The potential here lies in promoting the use of more renewable materials and biobased materials[59,60], to lower the effects that would have risen from binders made from petrochemicals.<br><br>Nordic Ecolabel sets requirement for manufacturers of chemical building products 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[61] 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<br>P = Medium<br>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.<br><br>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.<br>For a requirement to be introduced for Nordic Ecolabel Chemical building products, there are steerability issues regarding energy demand as it depends on variables such as energy infrastructure, climate zone and ambient temperature[62] which can differ depending on production site location throughout Europe. Hence, there is no requirement on this topic. |
| Alkyd reins | R = High<br>P = High<br>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.<br><br>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[63].<br>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.<br><br>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 chemical building products 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<br>P = High<br>S = Medium | Portland cement being the key ingredient in certain chemical building products such as mortars and plasters, is also one of the major sources of greenhouse gases. Portland Cement accounts for 5% of carbon dioxide emissions[64], 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. |

[59] https://www.pcimag.com/articles/109592-teknos-joins-project-to-develop-bio-based-binders-and-coatings#
[60] https://www.pcimag.com/articles/103863-biobased-polymers-for-sustainable-coatings
[61] https://www.johannebergsciencepark.com/sites/default/files/Final%20report%20-%20Value%20chain%20adhesives%20and%20paint.pdf
[62] Khripko, D., et al (2016) Energy demand and efficiency measures in polymer processing: comparison between temperate and Mediterranean operating plants.
[63] Eco-friendly Alkyd Resins Based on Vegetable Oil: Review
[64] The Cement Sustainability Initiative: https://docs.wbcsd.org/2016/12/GNR.pdf (visited 2022-05-30)

| | | |
|---|---|---|
| | | Nordic Ecolabel sets out requirements to restrict the global warming potential on the cement/hydraulic binder to limit the anthropogenic emissions of $CO_2$. |
| Feedstock for packaging | R = High<br>P = Medium<br>S = High | There is a relevance for plastic material and metal used as virgin material have a heavy climate impact. Furthermore, left-over residue from incorrectly disposed products can make the packaging difficult to recycle.<br>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<br>P = High<br>S = High | Chemicals used on the manufacturing plant and for the production of chemical building contain many difference substances and raw materials with many different harmful effects on the environment and health.<br>Nordic Ecolabel sets requirements to produce chemical building products to protect the worker and to limit the use of harmful substances during production. Furthermore, Nordic Ecolabel sets requirements for the production of chemical building products to protect the worker in the working environment to reduce exposure to dust and to promote good working conditions. |
| Emissions & Energy use | R = Medium<br>P = High<br>S = Medium | There is a relevance for the production of chemical building products 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 chemical building products. 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.<br>Energy use in chemical building products 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 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 the manufacturing, examples such as making the milling step more energy efficient, replacing old equipment or identifying locations with high energy use.<br>It is unclear how significant the impact of manufacturing is compared to the overall impact of the product. However, since the major environmental impact of the product is within the supply chain of the manufacturer, requirements are prioritized there rather at the manufacturer of the product. |
| **Use** | **RPS (high-medium-low)** | **Comment** |
| Exposure to chemicals that are harmful to the environment | R = High<br>P = High<br>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.<br>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 product is applied. |
| Preservatives and environmental harmful substances | R = High<br>P = High<br>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 product and prolong its shelf-life.<br>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<br>P = Medium<br>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.<br>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 products that are fragmented or sanded.<br>While biobased polymers can reduce the overall environmental footprints of chemical building products, they do not contribute to the microplastic reduction as they are still synthetic polymers.<br>A requirement for primary microplastic emissions at the production plant shows low steerability as the 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.<br>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 product applied may have microplastic emissions spread out over its lifetime for many years. Nordic Ecolabel instead sets out requirement for more longer durable products, as durability is considered one of the most promising characteristics to reduce microplastic emissions.[65] |
| Performance | R = High<br>P = High<br>S = High | There is a high relevance to the performance as during use-phase its application affects the amount of product needed to cover a surface, or its durability before the next reapplying period.<br>Nordic Ecolabelling sets strict quality requirements for high performing products in order to increase the reapplication period. By doing this, the resource use of the products decreases as the substrate does not have to be reapplied so often, and less frequent reapplications results in a lower overall environmental impact. |
| **Waste** | | |
| | R = Medium<br>P = Medium<br>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 the product. The building material may comprise of several different materials. It is therefore not practical to consider whether the product 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.<br>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 product. These can vary in quantity and content, depending on how they are used. |

## Relevance (R)

There are five product types within chemical building products, including fillers, sealants, adhesives, impregnating agents and mortars and plasters. The product types can in turn contain a number of subcategories for different functions and applications. What links the four product types (fillers, sealants, adhesives, and impregnating agents, and mortars and plasters) is that they contain chemicals that may be harmful to the environment and/or health, such as: binders, solvents, catalysts, hardeners, monomers, flame retardants and preservatives/biocides. The same types of ingredients also tend to appear in different chemical building products.

[65] 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

A consultant studied the classification of chemical building products based on information in safety data sheets, and the study showed that many of the constituent ingredients in these products are classed as harmful to the environment and/or health[66]. It has also become apparent that many of the finished chemical building products may be classed as harmful to the environment and/or health[67,68]. Chemical building products are used in large volumes[33]. 562,000 tonnes per year in the Nordic region of the products within the product group "Chemical building products".

### Potential (P)

Through active choices of ingredients or the formulation/reformulation of their recipe, producers are often able to reduce the environmental/health impact of their products.

Even minor adjustments to the product formulation (such as replacing an ingredient with one that is not as harmful to the environment and/or health, or one with less VOC) can generate a real environmental gain, because the products sell in such large volumes.

The useful life of the products also plays a major role in that increasing the lifespan for these products directly results in raw material and production savings. The quality requirements in this product group are therefore also directly associated with environmental gains.

### Steerability (S)

There are many large manufacturers of sealants, fillers, adhesives, impregnating agents and mortars and plasters, as well as numerous raw material suppliers for them to use. This creates a competitive situation which means that Nordic Ecolabelling can work well in stimulating the development of more environmentally friendly products.

Reports from public authorities and the industry itself indicate that ecolabelling can be a tool for steering development towards more environmentally aware products. The construction industry in general is highly competitive and price can often be a more important factor than the environment in procurement processes. However, there is an increasing demand for sustainable construction, which means that demand is also rising for products with a good environmental and health profile, giving them a stronger position in the market.

## 15.2 Relevance

Survey of substances that are harmful to the environment and health in chemical building products – National Institute of Technology (TI).

As part of the feasibility study for chemical building products, before development of the criteria began, the National Institute of Technology in Norway[69] conducted a survey of chemical building products on behalf of Nordic Ecolabelling. The study was completed in February 2008. It covered products on

[66] Inneklimakrav til kjemiske byggprodukter, TI, (February 2008).
[67] Official Statistics of Sweden; Statistiska Meddelanden MI 45 SM 1001: pp 25-26.
[68] Inneklimakrav til kjemiske byggprodukter, TI, (February 2008).
[69] National Institute of Technology, Miljøkrav til kjemiske byggprodukter, 2007

the Norwegian market but was taken as being representative of the whole Nordic region, since the products in the various countries are more or less of the same type.

The conclusions of the report were that emphasis should be placed on the following general considerations when setting criteria for the Nordic Ecolabelling of chemical building products.

- Prioritise polymers with the lowest emissions
- Avoid ecolabelling the most harmful products
- Focus on environmentally harmful additives
- Reduce the content of volatile organic compounds (VOC)
- Look at the performance of the product
- Ensure good information for the end user

### Raw material phase

It is relevant to set requirements concerning constituent substances, since there are often different variants of these raw materials which have differing impacts on health and the environment. The manufacturers of the products are largely able to influence which raw materials are chosen for each product.

Minerogenic raw materials are mined and processed before they are used in chemical building products (function in the products: filler, binder, pigment, etc.). Common minerogenic raw materials include limestone, gypsum, and cement raw materials, which play a crucial role as binders, providing structural strength and durability to the end products. Cement raw materials, such as limestone and clay, undergo extensive processing and contribute significantly to the environmental impact due to the energy-intensive production process and associated $CO_2$ emissions.

Fossil raw materials are mined and processed before they are used in chemical building products (function in the products: solvent, binder, filler, pigment, and preservative).

More than 300 raw materials go into manufacturing of chemical building products. Of those, around 70% are based on petroleum, but renewable oils can/could be used instead of petroleum. In the raw materials phase, in which raw materials for the chemical building products are produced, there are several clear and relevant environmental problems (associated with: mining operations, open-cast mining, oil drilling, oil palm growing, etc).

Plant raw materials are harvested/extracted before they are used in chemical building products (function in the products: rheology modifier, filler, pigment, polymer, etc). Binders are the main/key component in all subgroups, and also control the products' areas of use.

Fillers have an important function in determining the products' mechanical properties. Common fillers include chalk, calcium carbonate and talc, and cementitious materials that provide specific functionality in construction applications.

Viscosity regulators are used to enable smooth application of the products onto surfaces without running/dripping and to give the product the right consistency.

Substances commonly used include vegetable oils, resins, starches, and polyamide wax.

Solvents are organic substances used in relatively small quantities to allow easier application.

Plasticisers are added to certain products to give the "dried/hardened" end product the right elasticity. Phthalic acid esters and benzoic acid esters have previously been common, but rapid advances are being made in the area and other substances are also commonly used.

Pigments are used to give products the desired colour and can comprise 0-30% of these formulations. The most common pigments include titanium dioxide ($TiO_2$) and carbon black. $TiO_2$ is an excellent pigment due to its high opacity, brightness, and UV protection, making it ideal for a wide range of applications while remaining non-toxic and durable. However, titanium dioxide is also associated with environmental concerns due to the energy-intensive extraction and processing methods involved. Pigments represent a wide-ranging and heterogeneous group of substances that include inorganic compounds (typically metal oxides), organic compounds, and mixtures of both organic and inorganic materials within the same pigment molecule.

Preservatives and fungicides are used because the contents of the chemical building products are generally fodder for microorganisms, plus raw materials are used that are already hosts to microorganisms. Preservatives are therefore highly necessary in this context and usually the raw materials already come preserved. There are major health differences between different preservatives.

Additives such as hardeners and accelerators are also used to varying degrees.

### Production phase

During the manufacture of chemical building products, raw materials are blended together to create finished chemical building products, which are then packaged before they leave the factory. The greatest risk of exposure to substances that are harmful to health is via the airways. This risk is minimised in factories where the majority of production takes place in closed systems, but since it is not always possible for the whole production line to be a closed system, it remains relevant to limit the use of substances that are harmful to health in the products.

Energy consumption during manufacture is judged to be relatively low in terms of energy consumption per litre of product without water, since the process primarily involves raw materials being mixed to form the finished product, which is then packaged in plastic, metal or paper packaging. There is therefore less relevance in setting requirements concerning energy consumption in the process.

The "Other" section in the MECO analysis includes the working environment, and in this context dust-producing raw materials are a consideration. It is relevant to set requirements concerning these, since dust-producing raw materials pose a health risk.

### Usage phase

The products are applied manually or using a machine, and this subjects the user and the environment to exposure and/or risk of exposure to substances that are harmful to health and the environment in the products, and to emissions of

various volatile organic compounds (VOC) and allergens. During hardening/drying, the products may emit "new" substances arising from the hardening reaction, including methanol and formaldehyde (carcinogenic substances). It is therefore relevant to set requirements concerning the impact on health and the environment of the raw materials and the end products.

During the usage phase, chemical building products have an important secondary function in that they must last/perform for many years, perhaps 10-30 years depending on the subgroup. This makes it relevant to set requirements concerning quality and performance.

### Waste phase

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 the chemical building product. The building material may comprise a number of different materials. It is therefore not practical to consider whether the chemical building product 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 within the MECO analysis 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 chemical building products. These can vary in quantity and content, depending on how they are used.

### Transport

Transport in the raw material production phase from mining to manufacture of finished chemical building product is often extensive. Raw materials tend to be transported by rail and road within Europe, but also by sea from other continents.

The manufacture of chemical building products involves almost no vehicular transport, with transport primarily via pipeline and conveyor.
From the factories, the products will usually be distributed to retailers/builder's merchants but may also be transported directly to a building site. Transport will usually be by lorry.

Transport in the usage phase occurs between the stores/builder's merchants and the "building site" and transport of empty packaging from the site to the recycling station by lorry or car.

In the usage phase, waste material is removed by lorry from "large" demolition projects and by car for "small" DIY projects.
It is not relevant to set requirements concerning transport that the manufacturer of chemical building products cannot influence i.e., raw material transport and transport to the customer.

# 16 Potential and Steerability

Potential and steerability are considered here according to the structure of the MECO analysis, which divides the environmental impact of the various life cycle phases into the subgroups materials, energy, chemicals and other (MECO).

The text below outlines the various constituent parts in the MECO analysis for each phase according to the MECO model.

### Raw material phase

When it comes to machinery and permanent factories, we see no direct potential. However, there are differences in how the raw materials are extracted/produced and how much of an impact on the environment/ecosystem the raw material production causes. Some raw materials are plant extracts, such as raw materials used for rheology, fillers and polymers, and when extracting them in large scale they effect the biodiversity. Nordic Ecolabelling does not currently set separate requirements regarding plant extracts for chemical building products, it is important to recognize that requirements concerning extraction and production are already in place for certain raw materials, including acrylic and alkyd resin binders as well as cement and hydraulic binders.

Additionally, there is potential regarding emissions from factories, as well as the choice of energy source. These differences indicate a significant opportunity to establish requirements. However, the challenge lies in the fact that many of these issues often lie far beyond the licensee's control, perhaps 3-4 stages back in the production chain (see Figure 1). Therefore, while requirements are established for specific raw materials, it is complex to manage how they are applied across the entire supply chain.

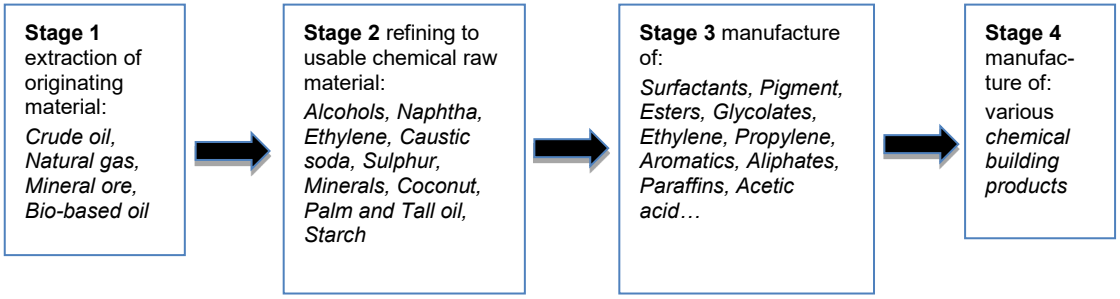


**Figure 1: Examples of common stages in the production chain[70].**

In terms of polymer production, it is extremely difficult to judge whether a polymer manufactured in a more energy efficient process can be used instead of a polymer manufactured in a more energy demanding process (and there is thus a lack of both potential and steerability). It may, however, be the case that the "same sort" of polymer has been manufactured with greater energy efficiency in one factory than in another (in which case only the steerability is difficult).

### Production phase

In the production phase, the raw materials are mixed to form finished chemical building products. The factories and machines already in existence have a long

[70] Evaluation of Nordic Ecolabelled Chemical Building Products, 14 September 2012, Evaluation of Nordic Ecolabelled Paints and Varnishes and Chemical Building Products, 8 February 2022.

lifetime and the process technology to manufacture adhesives, fillers, impregnating agents, and sealants is not particularly energy heavy. The process largely involves storage and internal transport of raw materials that are then batched and mixed to form finished products. The products are packaged and transported internally to a warehouse, before being sent for sale. We therefore see no potential or steerability for Materials and Energy in the production phase.

The "Other" category in the MECO analysis includes the working environment, where there is also potential for setting requirements and for steerability. It is possible for the producers to influence the raw materials used (they can choose raw materials that are better for the environment and health). They can also influence how the raw materials are added to the products (i.e. their form, enclosed systems, etc.) and can ensure that safety equipment is used where necessary (e.g. with dust-producing raw materials). Setting requirements concerning raw materials can therefore steer improvements in the working environment during manufacturing.

### Usage phase

In the usage phase, the finished chemical building products are used by tradesmen and private individuals. The steerability of material and energy use in this phase is non-existent.

The chemicals used in this phase are directly linked to what is contained in the chemical building products, and here there is potential to replace raw materials that are harmful to health and the environment with less harmful or non-classified raw materials. Emissions from the chemical building products used may also pose an environmental or health risk. This can be influenced by means of requirements concerning the product in question.

In the usage phase, it is also important that the products are used correctly and with the correct safety equipment where necessary. Requirements concerning instructions for the end user on usage and safety therefore have both potential and steerability, since correct adherence to the product and safety instructions reduces the risks during usage and improves the quality of the filling/glueing, etc.

### Waste phase

The waste phase is the stage during which used chemical building products are disposed of. The steerability of what happens in the waste phase is non-existent for everything except effects associated with the chemical content of the products, for which there is both potential and steerability. Chemical building products do not influence the recycling/reuse of old building materials and therefore we see no potential or steerability in this context.

The way packaging and any remains of the products are handled and disposed of or recycled is, however, steerable and has the potential to make a difference. Nordic Ecolabelling sets requirements that information concerning the handling of residues and empty packaging is made available to the user of the product.

There is also potential to reduce how much remains of the products in the discarded packaging by emptying/scraping out the packaging thoroughly.

However, there is very little steerability when it comes to verifying and documenting this.

### Transport

A great deal of transport is involved in the life cycle of chemical building products, which means that there is potential to make savings on transport. However, the majority of the transport remains outside the control of the manufacturers. Steerability is therefore almost non-existent for all transport except for the transport that takes place in the manufacture of the chemical building products, i.e. within the factory (e.g. from receipt of raw materials to warehousing). The amount of transport that takes place within the factories is, however, negligible in overall terms, and there is therefore no great potential or relevance.

# 17 Areas without requirement

A requirement for the energy consumption for 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[71] (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.

[71] “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).

# 18 Changes compared to previous generation

**Table 1 Overview of changes to criteria Chemical building products generation 3 compared with previous generation 2.**

| Overview of changes compared to previous versions of the respective criteria | | | | | |
|---|---|---|---|---|---|
| **Proposed requirement generation 3** | **Requirement generation 2** | **Same req.** | **Change** | **New req.** | **Comment** |
| Product definition | | | X | | Mortars and plasters are now included in the scope. |
| O1 Information of the product | O1 | X | | | |
| O2 Classification of the product | O2 | | X | | EUH208 restriction has been removed.<br>Exemptions for H317 and H412 for outdoor paints and industrial paints and H400, H410 and H411 for anti-corrosion paints have been removed as they are no longer in the scope of the criteria. |
| O3 Classification of ingoing substances | O3 | | | X | New CLP-classifications have been added.<br>Time-limited exemption for trimethylolpropane (TMP) has been extended.<br>Bisphenol An exemption removed. |
| O4 Environmentally harmful substances | O4 | | X | | Limit value changed from 11% to 8%.<br>Zink and zinc compounds exemption removed. Zinc oxide used as stabilizer is now exempted from the calculation up to 2500 ppm. |
| O5 Preservatives | O5 | | X | | Total preservatives and IPBC limit values have been lowered for all product types.<br>DBNPA clarified to be exempted from calculation of total preservatives. |
| O6 Formaldehyde | O6 | | X | | Formaldehyde emission testing now as an additional requirement for indoor products. |
| O7 Residual monomers in polymers | O7 | | X | | Limit of vinyl acetate monomer lowered to 700 ppm. |
| O8 Heavy metals | O8 | | X | | Limit value for lead in raw materials has been increased to 200 ppm for mortars and plasters. |
| O9 Titanium dioxide | O9 | | 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.<br>DBNPA is exempted in all forms used in the production of chemical building products or used as an in-can preservative in raw materials or the chemical building product.<br>New prohibited substances |

| Overview of changes compared to previous versions of the respective criteria | | | | | |
|---|---|---|---|---|---|
| **Proposed requirement generation 3** | **Requirement generation 2** | **Same req.** | **Change** | **New req.** | **Comment** |
| | | | | | added.<br>Prohibition of boric substances and EDTA/DTPA added.<br>BHT added as an exemption. |
| O13 Acrylic and alkyd resin binders | | | | X | Policy requirement for renewable raw materials. |
| O14 Cement/hydraulic binders | | | | X | EPD requirement and GWP-limit for different types of hydraulic binders. |
| O15 Volatile aromatic compounds (adhesives) | O13 | | X | | Requirement divided into two requirements. |
| O16 Volatile organic compounds (adhesives) | O13 | | X | | Requirement divided into two requirements. |
| O17 Emission of total volatile compounds (TVOC) and semi-volatile organic compounds (TSVOC) in adhesives | O14 | | X | | Requirement has been changed to emission testing according to EN 16516. Emission limit values for adhesives has been tightened.<br>Emission for TSVOC has been added but no limit value required, data requirement. |
| O18 Quality requirements (adhesives) | O15 | X | | | |
| O19 Volatile aromatic compounds (sealants) | O16 | | X | | Requirement divided into two requirements. |
| O20 Volatile organic compounds (sealants) | O16 | | X | | Requirement divided into two requirements. |
| O21 Emission of total volatile compounds (TVOC) and semi-volatile organic compounds (TSVOC) in sealants | O17 | | X | | Requirement has been changed to emission testing according to EN 16516. Emission limit values for sealants has been tightened.<br>Emission for TSVOC has been added but no limit value required, data requirement |
| O22 Quality requirements (sealants) | O18 | X | | | |
| O23 Volatile aromatic compounds (fillers) | O19 | | X | | Requirement divided into two requirements. |
| O24 Volatile organic compounds (fillers) | O19 | | X | | Requirement divided into two requirements. |
| O25 Emission of total volatile compounds (TVOC) and semi-volatile organic compounds (TSVOC) in sealants | O20 | | X | | Requirement has been changed to emission testing according to EN 16516. Emission limit values for fillers has been tightened.<br>Emission for TSVOC has been added but no limit value required, data requirement |
| O26 Quality requirements (fillers) | O21 | X | | | |
| O27 Volatile aromatic compounds (impregnating agents) | O29 | | X | | Requirement divided into two requirements. |
| O28 Volatile organic compounds (impregnating agents) | O29 | | X | | Requirement divided into two requirements. VOC limit increased to 1% to align with other product types and allow more diverse products. |
| O29 Emission of total volatile compounds (TVOC) and | | | | X | New requirement for emission testing according to EN 16516. |

| Overview of changes compared to previous versions of the respective criteria | | | | | |
|---|---|---|---|---|---|
| **Proposed requirement generation 3** | **Requirement generation 2** | **Same req.** | **Change** | **New req.** | **Comment** |
| semi-volatile organic compounds (TSVOC) in impregnating agents | | | | | Emission for TSVOC has been added but no limit value required, data requirement. |
| O30 Quality requirements (impregnating agents) | O30 | | X | | |
| O31 Volatile aromatic compounds (mortars and plasters) | | | | X | Requirement in line with other product types. |
| O32 Volatile organic compounds (mortars and plasters) | | | | X | Requirement in line with other product types. |
| O33 Emission of total volatile compounds (TVOC) and semi-volatile organic compounds (TSVOC) in mortars and plasters | | | | X | New requirement for emission testing according to EN 16516.<br>Emission for TSVOC has been added but no limit value required, data requirement. |
| O34 Quality requirements (mortars and plasters) | | | | X | Quality requirements for mortars and plasters in line with other product types. |
| O35 Packaging | O33 | | X | | Previous requirements removed and changed to require 30% recycled material in plastic packaging. Several packaging types are exempted from the requirement. |
| O36 Consumer information | O35 | | X | | Minor changes to align with the criteria of 096. |