About Nordic Ecolabelled

Chemical building products



Version 2.17

Background to ecolabelling
23 februari 2021

Nordic Ecolabelling

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This document is a translation of an original in Swedish. In case of dispute, the original document should be taken as authoritative.

Addresses

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
Danish Standards Foundation
Göteborg Plads 1, DK-2150 Nordhavn
Fischersgade 56, DK-9670 Løgstør
Tel: +45 72 300 450
info@ecolabel.dk
www.ecolabel.dk

Finland
Ecolabelling Finland
Urho Kekkosen katu 4-6 E
FI-00100 HELSINKI
Tel +358 9 61 22 50 00
joutsen@ecolabel.fi
www.ecolabel.fi

Iceland
Ecolabelling Iceland
Umhverfisstofnun
Suðurlandsbraut 24
IS-108 REYKJAVIK
Tel: +354 5 91 20 00
ust@ust.is
www.svanurinn.is

Norway
Ecolabelling Norway
Henrik Ibsens gate 20
NO-0255 OSLO
Tel: +47 24 14 46 00
info@svanemerket.no
www.svanemerket.no

Sweden
Ecolabelling Sweden
Box 38114
SE-100 64 STOCKHOLM
Tel: +46 8 55 55 24 00
info@svanen.se
www.svanen.se

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1 Summary

In the product group chemical building products there are many different kinds of products. The products are used in large volumes[1] approx. 562,000 tonnes per year in the Nordic region plus 325,000 tonnes per year of industrial paint and varnish),[2] which makes influencing the chemical content of the products a highly relevant action to take.

A survey of chemical building products has shown that many of the products[3,4] and their constituent substances are classified as harmful to the environment and/or health[5]. Nordic Ecolabelling has therefore chosen to focus on requirements that control the content through limits on various substances depending on their inherent properties, and also that limit emissions of substances such as VOC.

Nordic Ecolabelling has come to the conclusion that the most relevant parameters for chemical building products are that they:

- Contain low levels of substances that are harmful to health and the environment
- Have low emissions to air and water
- Are effective and meet tough performance standards

There are currently around 100 ecolabelled chemical building products, which means that Nordic Ecolabelling has generated an environmental gain by limiting the use of undesirable chemicals in society within this large product group.

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 aforementioned relatively large volumes of chemical building products, gives a strong indication that a significant environmental gain has been generated.

2 Basic facts about the criteria

Products that can be labelled

The product group definition below has been updated compared with version 1. Paints and varnishes for industrial applications have been added as a new subcategory. This category includes paints (in liquid and powder form) that are applied through for example spraying, curtain coating and dipping.

Adhesives for industrial use have not been included in this version, but will appear as a point in future versions. The focus at this time has been on formulating sound requirements for industrial paints and varnishes. On November 7, 2018 the product group has been expanded with following industrial adhesives: multipurpose adhesives / construction adhesives intended for industrial use. All requirements relating to glue also apply to anchor arms. Enlargement was made as there is relevance and potential and controllability with anchor arms. There are differences between anchor masses on the market: many

[1] Official Statistics of Sweden; Statistiska Meddelanden MI 45 SM 1001: pp 25-26.
[2] Evaluation of Nordic Ecolabelled Chemical Building Products, 14 September 2012: pp 7-8.
[3] Inneklimakrav til kjemiske byggprodukter, TI, (February 2008).
[4] Official Statistics of Sweden; Statistiska Meddelanden MI 45 SM 1001: pp 25-26.
[5] Inneklimakrav til kjemiske byggprodukter, TI, (February 2008).

contain substances classified CMR and sensitizing. In addition, Nordic Ecolabelling places heavy demands on substances that are classified as hazardous to the environment.

On March 12, 2019 Nordic Ecolabelling decided to expand the criteria for chemical building products with impregnating agents for tiles, stone and concrete (facade impregnation included). There is relevance, potential and steerability for doing so since there are differences between impregnating products on the market: namely they may contain fluorinated compounds, solvents, surfactants and various preservatives.

On March 31, 2020 Nordic Ecolabelling decided to expand the criteria for chemical building products with anti-corrosion paints for industry and infrastructure. Traditional anti-corrosion paints contain solvents, aromatic hydrocarbons, endocrine disruptive and sensitizing substances, as well as substances that are harmful to health and the environment. Anti-corrosion paints generally have a relatively large environmental impact, both on the external environment and on the working environmement when painting. However, there are types of paints that provide a good quality completely without or with a significantly smaller amount of these hazardous substance groups. For example, waterborne zinc silicates provide very good corrosion protection, while being free from solvents, allergens and toxic substanes. With the exception of their zinc content, the paint is considered to be a significant improvement from an environmental point of view. Despite better environmental footprint, zinc silicates are used very little in the Nordic countries, which is mainly due to historical reasons, economic incentives and the culture of the industry. In summary, the expansion of the product group is deemed to have a good relevance, potential and steerability.

Chemical building products refers to liquid or non-hardened products for use in building work both indoors and outdoors, and on different substrates.

Until further notice, the product group covers the following products for manual and machine application:

- Adhesives*
- Sealants
- Fillers / screed (including primers to these)
- Outdoor paints and varnishes** (including primers to these)
- Paints and varnishes for industrial application***
- Impregnating agents for tiles, stone and concrete****
- Anti-corrosion paint for industry and infrastructure*****

** 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.*

*** Outdoor paints and varnishes cover products that are applied manually.*

**** Industrial paints and varnishes refers here to paints that are used and manufactured for industrial applications such as painting furniture/panels for indoor and outdoor usage. Criteria already exist for the Nordic Ecolabelling of indoor paints and varnishes, and thus these cannot be ecolabelled under the criteria below.*

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

****** Anti-corrosion paint for industry and infrastructure refers to paints containing anticorrosive pigments.*

Note that tinting pastes/colorants can be Nordic Ecolabelled only if they are part of a Nordic Ecolabelled tinting system. Calculations of the content are then done for the complete tinting system (tinting paste, base paint and hardener).

Solid building products such as insulation materials and plastic products, pure concrete, etc. cannot be Nordic Ecolabelled under these criteria. Criteria already exist for Nordic Ecolabelling, for example, houses, windows and external doors, floors, furniture and fitments (including internal doors and stairs), building panels and sustainable wood /durable wood-alternative to conventionally impregnated wood.

Nordic Ecolabelling made a clearification of "Products that can be labelled" on August 12.

Justification for Nordic Ecolabelling

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[6]. 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-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. 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. See also section 4 for more about the MECO analysis.

Relevance (R)

There are a number of chemical building products, including fillers, sealants, adhesives, outdoor paints and varnishes and industrial paints and varnishes. These products can in turn contain a number of subcategories for different functions and applications. What links the four product types (fillers, sealants, adhesives and paints & varnishes) 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 ingredient also tend to appear in different chemical building products.

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

[6] Nordic Ecolabelling's environmental objectives: http://www.nordic-ecolabel.org/about/the-mission/

these products are classed as harmful to the environment and/or health[7]. It has also become apparent that many of the finished chemical building products may be classed as harmful to the environment and/or health[8,9]. Chemical building products are used in large volumes[10] (approx. 562,000 tonnes per year in the Nordic region of the products within the product group "Chemical building products" and approximately 325,000 tonnes per year of industrial paint and varnish)[11], which makes influencing the chemical content of the products a highly relevant action to take.

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 (although there are critical factors surrounding the choice of ingredients, as described in section 4 “Critical factors”).

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 and paints & varnishes, 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.

Version and validity of the criteria

The first version of the criteria document was adopted by the Nordic Ecolabelling Board on 29 May 2008 and was to remain valid until 30 June 2011.

The second version of the criteria document was adopted by the Nordic Ecolabelling Board on 19 March 2014 and is to remain valid until 31 March 2019.

[7] Inneklimakrav til kjemiske byggprodukter, TI, (February 2008).
[8] Official Statistics of Sweden; Statistiska Meddelanden MI 45 SM 1001: pp 25-26.
[9] Inneklimakrav til kjemiske byggprodukter, TI, (February 2008).
[10] Official Statistics of Sweden; Statistiska Meddelanden MI 45 SM 1001: pp 25-26.
[11] Evaluation of Nordic Ecolabelled Chemical Building Products, 14 September 2012: pp 7-8.

The Nordic market

The companies that manufacture chemical building products come in all sizes, from sole traders to multinational companies and groups. Several parallel marketing stages exist simultaneously within the industry. New products are constantly being developed within chemical building products.

The industry is not currently undergoing any significant structural changes. What can be noted generally is that the large groups (such as Saint Gobain and Tikkurila) often buy up smaller companies with good potential for development. There are also major multi-nationals in this industry such as Jotun, AkzoNobel, Henkel and Sika Group.

Nordic Ecolabel licences

Over the four years that the Criteria for Chemical Building Products have been in existence, 14 licences have been granted (note that some of the licenses have products from more than one category in the table below), covering a total of around 100-150 products. The licences are distributed as shown in Table 2.1 below.

Table 2.1. Summary of licences in each product category (Feb 2013)

	Outdoor paints and varnishes		**Adhesives**		**Fillers**	
	Licences	**Reg**	**Licences**	**Reg**	**Licences**	**Reg**
Denmark	2	3	1	2	1	2
Finland	1	2	0	2	0	1
Iceland	0	0	0	1	0	0
Norway	1	2	1	1	2	2
Sweden	3	1	1	1	4	2

Other labels

There are many different labels and steering instruments for chemical building products that focus on different parameters such as health, quality and the environment.

Since the number of labels in itself constitutes a problem, we have chosen only to present the most significant (largest) systems below, see also Appendix 1.

EPD (Environmental Product Declaration)[12], M1 (the Finnish indoor climate label)[13], Danish indoor climate label, the Joint Council for Creative and Hobby Materials' A, B, C or D label[14], CE marking[15], ECOproduct[16] [17], the P symbol[18] (a scheme operated by SP Technical Research Institute of Sweden and the Swedish Institute for Technical Approval

[12] About the EPD system, Swedish Environmental Management Council, Sweden. Available at: http://www.msr.se/sv/epd/ (visited 26.04.12)
[13] FiSIAQ, Finland. Available at: http://www.sisailmayhdistys.fi/portal/fisiaq_in_english/ (visited 27.04.12)
[14] Survey of Chemical Substances in Consumer Products, No. 93 2008.
[15] CE marking, European Commission. Available at: http://ec.europa.eu/enterprise/policies/single-market-goods/cemarking/index_sv.htm (visited 27.04.12)
[16] Integrated product policy and eco-product development; Martin Charter, et al: The Centre for Sustainable Design, UK. Greenleaf Publishing Ltd (2001).
[17] Integrated product policy and eco-product development; Martin Charter, et al: The Centre for Sustainable Design, UK. Greenleaf Publishing Ltd (2001).
[18] P symbol (SP), Available at: http://www.sp.se/sv/index/services/p_mark/sidor/default.aspx (visited 27.04.12)

in Construction), VTT[19] (Technical Research Centre of Finland), the Danish MAL codes[20] (concerning inhalation hazards) and the EU Ecolabel (criteria for outdoor paints[21]).

The EU's Construction Products Directive (CPD) & harmonised product standard
As of 1 July 2013, all construction products covered by a harmonised standard or European technical assessment (ETA) must, in order to be sold in Sweden and other EU countries, have a performance declaration and be CE labelled. This is regulated by the EU's Construction Products Directive (305/2011/EC), abbreviated CPD, which also applies in Norway, Switzerland, Iceland, Turkey and Lichtenstein. The purpose of this regulation is to facilitate trade between these countries. The appendix to the Construction Products Directive contains a managed template for performance declaration. Once this template has been completed by the manufacturer the product can be CE labelled.

3 About the criteria review/revision

Goals of the criteria review/revision

To put forward a revised version (version 2.0) of the Criteria for Chemical Building Products, expanded to include industrial paints and varnishes.

About this criteria review/revision

The project was planned and run as a Nordic project. In January 2013, the project moved over into the new project organisation, which meant new roles and so on. The revision ran through autumn 2012 and on into 2013.

Project participants:

	2012	**2013/2014**
Project Manager	Svante Sterner (Sweden)	Terhi Uusitalo (Finland) / Susanna Vesterlund (Sweden)
Nordic Product Adviser/Nordic transitional team member	Randi Rødseth (Norway)	Svante Sterner (Sweden)
Nordic Area Coordinator/ Nordic Product Development Manager	Karen Dahl Jensen (Denmark)	Karen Dahl Jensen (Denmark)

During the project external input was sought on an ongoing basis from the likes of licence holders and manufacturers, and through an external consultation during the period October-December 2013.

The most significant changes made in this version are:

- The product group definition has been expanded to include industrial paints and varnishes
- Update with classification terminology according to CLP
- New calculation of environmentally harmful substances
- New nano requirement
- New VOC limits for outdoor paints, and requirements concerning test reports

[19] Technical Research Centre of Finland (VTT). Available at: http://www.vtt.fi/?lang=sv (visited 27.04.12)
[20] MAL codes. Available at: http://www.mst.dk/Borger/Temaer/Gor_det_selv/Faktaark/Fakta_om_malkoder.htm (visited 27.04.12)
[21] EU Ecolabe: http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:32009D0543:EN:NOT

- New quality requirements for industrial paints and varnishes
- Updated consumer information
- A new requirement on sorting waste has been introduced

4 Justification of the requirements

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.

We have also applied a method for life cycle assessment as described in "Handbook on environmental assessment of products"[22]. Using this method, we conducted a MECO analysis, which looks at the combined impact of materials, energy, chemicals and other aspects (such as waste, transport and so on) for chemical building products. It was drawn up in conjunction with the assessment of the criteria in 2012 in order to update the product group's RPS (Relevance, Potential and Steerability) analysis. The MECO analysis can be viewed in Appendix 2.

The MECO analysis was used to identify which areas pose the greatest environmental and health challenges for chemical building products, and therefore where it is most relevant to set requirements. The chemicals section of the MECO analysis is extremely important for the product group chemical building products. It is possible to improve the MECO analysis by adding energy data, but it is difficult to establish energy data for chemical substances and their environmental impact, so we have chosen not to do so. Manufacturers have difficulty in switching from one sort of raw material (e.g. paraffin) to a completely different type of raw material (e.g. methanol) to reduce their energy consumption. Raw materials of the same type are considered to have similar manufacturing processes and energy consumption.

There are many chemical building products and constituent substances that have a harmful effect on the environment and/or health. The MECO analysis indicates that discharges and emissions from various raw materials during production and use are the most significant parameters. The working environment during production and during use of the end product is also a point where there is an RPS.

[22] Miljöstyrelsen, 2001: www.mst.dk

Below is a more specific/detailed RPS for the product group in question, with reference to the raw materials phase, the production phase, the usage phase, waste and transport.

4.1 Relevance, potential and steerability

4.1.1 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[23] conducted a survey of chemical building products on behalf of Nordic Ecolabelling. The study was completed in February 2008. It covered products on 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 conclusion of the report was 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.).

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).

Generally speaking, over 300 raw materials go into manufacturing paints. 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).

[23] National Institute of Technology, Miljøkrav til kjemiske byggprodukter, 2007

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.

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. Phthalatic 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 the product the desired colour and may make up 0-30% of these products. The most common pigments are probably titanium dioxide (TiO_2) and carbon black. Pigments are a wide-ranging and heterogeneous group of substances comprising inorganic compounds (usually metal oxides), organic compounds and mixtures of organic and inorganic compounds in 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 paint, varnish, adhesive, sealant or filler. 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.

4.1.2 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.

Appendix 2 contains more on how the RPS is assessed for each part of the life cycle, structured according to the MECO model, as presented in the evaluation report from 14 September 2012.

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 consider this to be done in a very large scale for chemical building products and will therefore not add separate requirements regarding plant extracts. There is also potential when it comes to emissions from factories, as well as choice of energy source.

These differences in themselves indicate potential to set ecolabelling requirements. However, the problem is that this often lies far beyond the licensee's control; perhaps 3-4 stages back in the production chain (see Figure 1). This means that in the current situation, it is difficult to see how it would be steerable/controllable to set requirements concerning extraction and production of raw materials.

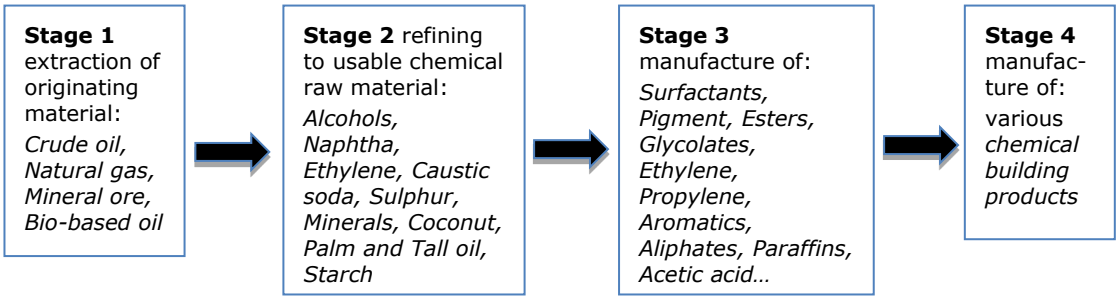


Figure 1: Examples of common stages in the production chain[24].

When it comes to the manufacture of TiO_2, we currently have requirements concerning emissions associated with the production of this raw material. The process of manufacturing TiO_2 takes an extremely heavy toll on the environment and has long been a focus of concern within the paint industry. However, due to the oligopoly that exists in the manufacture of TiO_2 it is hard to determine the steerability in this area.

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

[24] Evaluation of Nordic Ecolabelled Chemical Building Products, 14 September 2012

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 together to form finished chemical building products. The factories and machines already in existence have a long lifetime and the process technology to manufacture paints, varnishes, adhesives, fillers 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 painting/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.

4.2 General environmental requirements

The requirements in Chapter 1 "General environmental requirements" apply to all constituent substances unless otherwise stated.

Constituent substances/impurities

The term constituent substance refers to all substances in the product, including additives in the ingredients (such as preservatives and stabilisers) but does not include impurities from primary production. Impurity refers to residues from primary production which may be found in the finished product at concentrations below 100 ppm (0.0100% by weight, 100 mg/kg), but not substances that have been added to a raw material or the product actively and for a particular purpose, irrespective of quantity.

Impurities of over 1.0% concentration in the primary product are, however, regarded as constituent substances. Substances known to be degradation products of the constituent substances are also themselves considered to be constituent substances.

The limit of 1.0% impurities in the raw materials has been set to encourage manufacturers to choose goods of high quality that contain very small quantities of trace substances from primary production of the raw materials. The level has been chosen in consideration of the working environment and the classification of the raw material.

O1 Information about the product

The product is to be described such that it can be determined that the product falls within the product group definition and that it is thus relevant to show compliance with the other requirements in the criteria document. It is also important the Nordic Ecolabelling has good knowledge of the Nordic Ecolabelled chemical building products. Without this knowledge, it is not possible to determine which criteria are relevant and what requirements should be set for the product in the future. Nordic Ecolabelling would therefore like to have information on the formulation of the product and what application method it is intended for. In cases where products are part of a multi-component product with a base and a hardener, such as Araldite adhesive, where the components are mixed together before application it is important that the whole multi-component product is both checked and ecolabelled. This makes it possible to clearly communicate what is eco-labelled and what is not. In other words, the requirement applies to individual products and not products in the same range with different functions.

O1 Requirement text:

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

- Describe the product and its application method and the way in which it fulfils the definition of a product that qualifies for a Nordic Ecolabel
- If the product forms part of a component system that jointly ensures the functioning of the product, the entire product must be Nordic Ecolabelled and not simply parts of it (e.g. two-component varnishes comprising a base and a hardener). The requirement thus refers to the individual product and not to products in the same range (a range is here e.g. systems for exterior painting comprising primer, undercoat and paint).
- Formulation detailing complete composition with a specification of all constituent substances (see definition of constituent substances in Chapter 1). The description must include:
  - The chemical name
  - The trade name and CAS no. of the ingredient
  - The function of each ingredient
  - The boiling point (for constituent organic substances, where relevant)

☒ Description of the product in accordance with the definition of what may be Nordic Ecolabelled.

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

☒ Formulation detailing complete composition with a specification of all constituent substances, as set out in Appendix 3.

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, sensitising, carcinogenic, mutagenic, toxic for reproduction, explosive, oxidising and/or highly flammable cannot be ecolabelled.

Classifications are to be given in accordance with the prevailing CLP Regulation EC (No) 1272/2008.

This requirement excludes products that are classified as sensitising with the following classification*:

- Resp sens category 1; H334
- Skin sens category 1; H317
  and/or
- Products that contain substances in quantities that result in being labelled "Contains (name of sensitising substance), may cause an allergic reaction."

This last point is new compared with the previous version of the criteria.

***Exemptions**
The criteria document exempts isothiazolinones and IPBC (iodopropynyl butylcarbamate,

see below) which are classified as H317 or require the warning phrase EUH208 "Contains xxx, may cause an allergic reaction", as these substances are considered necessary preservatives for this type of product.

According to ATP2 (2nd Adaption to Technical Process) of CLP all sensitising substances with a specific concentration limit for classification has to put the risk phrase ("Contains (name of sensitising substance), may cause an allergic reaction")on the packaging from 1/10 of the classification limit. This means that for example the preservatives CMIT/MIT will cause the risk phrase on the final products from amounts ≥ 1.5 ppm and BIT in amounts ≥ 50 ppm.

The exemption has been adjusted after the public hearing to exempt preservatives even in other products than just exterior paint as long as they are added as in can preservatives. The products receiving the risk phrase due to the use of film preservatives need to show a weathering growth test. See more about IPBC and isothiazolinones below.

Multipurpose adhesives / construction adhesives added to the product group have also been exempted from labeling with EUH 208 provided that the application device / package will prevent the user from coming into contact with the product when applied. The exception is motivated by the fact that the exposure is limited as the product is injected into the borehole with a sealant gun. The products are in paste form so there is no splash (cf. paints). That the user does not come into contact with the product can be documented with, for example, instructions on how to use equipment when applying and how to apply so as to avoid contact with unhardened product.

Anti-corrosion paint for industry and infrastructure added to the product group have been exempted from labeling for all environmental hazard classifications if the content is due to zinc or zinc compounds in two-component products. Allowing environmental hazardous substances goes against Nordic Ecolabelling environmental toxins policy, but in this case it can be justified by the fact that large commissioners, such as national transport agencies, hydropower industries, paper and pulp industry, the building sector and the offshore industry often require that anti-corrosion paints contain zinc. As an example, the following requirements are documentet from the respective industry, SIS-TS 44, AMA Anläggning, Painting instructions for hydropower stations, SSG 1012 and EN ISO 12944-9. The fact that the requirements of these market players look the way they do is due to the fact that paints with zinc-rich content usually provides a much more durable coating. This is because zinc greatly reduces corrosion on steel, either through active cathodic protection or by forming anti-corrosive zinc salts. Zinc is not toxic to humans but can, however, damage aquatic organisms, therefore it is important to reduce zinc leaching where there is a risk that the zinc contaminates sensitive recipients. Compared to hot-dip ganvalized steel, anti-corrosion paints leaches less zinc. An example is zinc silicate paints which provides a slower leaching if the zinc pigment has been passivated by chemically bounding to the silicate. Zinc in the form of zinc silicate have a relatively low solubility, which can reduce zinc leakage in environments with high corrosivity. Traditional epoxy and polyurethane anti-corrosion paints contain less zinc, since the zinc in this type of paint is also encapsulated by topcoats, and they also probably leak less zinc compared to zinc-plated steel. However these type of paints involve risks related to CMR-classified substances, such as VAH and allergens. Traditional anti-corrosion paints also have an impact on the environment in the form of leaching of other toxic substances, spread of microplastics and emisisons of VOC and formation of ground-level ozone. Although zinc leaching occurs from these anti-corrosion paints, it is a better alternative

from a life cycle perspective to exempt zinc than to allow VOC, VAH, allergens and CMR-substances. Furthermore, resources are saved by using products with a long durability, which results in the repainting periods being in longer intervals and the consumption of resources and the risks of use are reduced.

IPBC (iodopropynyl butylcarbamate, CAS no. 55406-53-6)

IPBC is a fungicide primarily used in paint products as the sole fungicide (or in combination with other fungicides) to give increased and longer lasting protection against fungal growth. The substance is often used to provide surface protection at levels below 1%. IPBC is mainly used in wood paints, wet room adhesives and to some extent in fillers. The warning phrase "Contains IPBC, may cause an allergic reaction" may be necessary for these paints (if IPBC content is 0.1-1%) or classification as Skin sens 1 (H317) (if IPBC content is > 1%). The hazard class H317 is not known to be appropriate for adhesives and fillers. An exemption for IPBC classified as Skin sens 1 (H317) or with the risk phrase "Contains IPBC, may cause an allergic reaction" in outdoor paints has therefore been introduced into the requirement. This also appeared in the previous version of the criteria. See also requirements concerning IPBC under O5.

IPBC was assessed as part of the development work for REACH and the EU's Biocidal Products Directive (98/8/EC). According to the ECHA webpage IPBC is to be classified as H302, H334, H318, H317, H372, H400 and H410. The substance is to be taken up for harmonised classification in 2014.

Isothiazolinones

Isothiazolinones are used as a preservative in many products, where they act as fungicides, biocides and algal growth inhibitors. They are, however, toxic to aquatic organisms and they have varying degrees of sensitising effect, see also requirements under O5.

Since some isothiazolinones, such as DCOIT (4,5-dichloro-2-octyl-2H-isothiazol-3-one: CAS no. 64359-81-5), are used in paints, for example, as an alternative to IPBC, due to their similar technical properties, isothiazolinones are exempted on the same grounds as those given for IPBC above.

Change in the requirements 25 February 2015:
The Nordic Ecolabelling Board decided 25 February to include an exception in requirement O2 ("Outdoor paints classified as H412 are exempted from this requirement if the classification is due to preservatives/biocides.") and in O4 ("IPBC is exempted from the calcultation of environmentally harmful substances"). The background for the decision was as follows:

"In chemical building products several constituent substances is used to give functional products. Since the new version 2 of the criteriea was published (March 2014), several ingoing substances have been reclassified due to CLP. The preservative IPBC (iodoproynyl butylcarbamate - used in outdoor paints to prevent fungus growth), is now classified as H410 (very toxic to aquatic life with long-lasting effects). This means the product/outdoor paints will be classified as H412 with >0.25% IPBC in the product. The paints have not been more environmentally harmful, but the classification has been changed.

Be aware that H412 will not cause "Dead fish"-symbol on the product, but the following risk phrase will be on the product: " Harmful to aquatic life with long lasting effects".

Nordic Ecolabelled products classified as environmentally harmful will be a challenge. It is against our policy for environmental toxins and against the public view of what may be Ecolabelled. In the recent years there have been several reclassifications because of the new rules of CLP. This is also a challenge in other criteriea. Generally there is a risk for "devaluation" of the hazard symbol and -classification, when a greater proportion of everyday products are affected.

The amount of IPBC in Nordic Ecolabelled outdoor paints will be limited of requirement O5 Preservatives (maximum 0.45%)."

Nordic Ecolabelling decided to update the requirement on 12 August 2015, so that only the CLP regulation is valid.

O2 Requirement text:
The product must not be classified or labelled according to table 1 below. The classification must be in line with current legislation (CLP Regulation (EC) No 1272/2008.

Table 1 Classification of the product

Classification according to CLP Regulation 1272/2008	
Hazard class and category	**H-phrase**
Toxic to aquatic organisms Category acute 1 Chronic 1-4	H400****, H410****, H411****, H412***)****, H413****
Hazardous to the ozone layer	H420
Acute toxicity Category 1-4	H300, H310, H330, H301, H311, H331, H302, H312, H332, H370, H372
Specific target organ toxicity (STOT) with single and repeated exposure STOT SE category 1-2 STOT RE category 1-2	H370, H371, H372, H373
Aspiration hazard, Category 1	H304
Airway or skin sensitising Category 1	H334, H317**, and the product must not contain constituent substances in quantities that result in the label EUH208 "Contains (name of sensitising substance), may cause an allergic reaction"*
Skin corrosion or irritation Skin corr. 1A/1B/C	H314
Carcinogenic, Carc 1A/1B/2	H350, H350i, H351
Mutagenic Mut 1A/B/2	H340, H341
Toxic for reproduction Repr 1A/1B/2	H360, H361, H362
Explosive, Category 1.1-1.6	H200, H201, H202, H203, H204,H205
Oxidising	H240, H241, H242, H270, H271, H272
Highly flammable	H220, H221, H224, H242

**Exemption from this risk phrase if it is due to the content of in-can preservatives, see also O5 concerning preservatives. Exemption also for multipurpose adhesives / construction adhesives provided that the application device / package will prevent the user from coming into contact with the product when applied.*

***Outdoor paints and varnishes are also exempted from this where they are classified as H317 or require the label "Contains (name of sensitising substance), may cause an allergic reaction" if this is due to the content of preservatives used as film preservatives if they according to O5 perform the weathering test for growth, see further requirements on preservatives in O5.*

****Outdoor paints classified as H412 are exempted from this requirement if the classifiacation is due to preservatives/biocides.*

***** Exemption from this risk phrase if the content is due to zinc or zinc compounds in two-component products in anti-corrosion paints for industry and infrastructure.*

Note that responsibility for correct classification lies with the manufacturer.

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

☒ Documentation of content of above exempted preservatives as a declaration of the concentration of the preservative and if it has been added as an in-can or film-preservative.

☒ Multipurpose adhesives/construction adhesives labelled with EUH208: Documentation (e.g. schematic or text) that the application device / package will prevent the user from coming into contact with the product when applied.

O3 Classification of constituent chemical substances

For the same reasons described under requirement O2, there is a requirement that none of the constituent substances are classified as carcinogenic, mutagenic or toxic for reproduction. Formaldehyde is exempted from this requirement, with special requirements stated in O6 – the reason for the exemption is described under "formaldehyde".

Nordic Ecolabelling wishes to limit the health effects of chemical building products and therefore excludes from use any constituent substances that are classified as acutely toxic, airway sensitising and/or having specific target organ toxicity. Classifications are to be given in accordance with the prevailing CLP Regulation EC (No) 1272/2008.

Naphtha[25]

Naphthas are refined from crude oil, coal tar or other primary sources[26]. Naphtha cannot be defined with a unique CAS number, since there are many variants under the same CAS no. Nordic Ecolabelling has no separate requirement excluding naphtha from use, as most naphthas are excluded by this requirement, since they are very toxic, toxic or harmful to health/classified as Acute Tox. Cat. 1-4. Naphtha can also be carcinogenic and may contain various impurities that are harmful to the environment and/or health. The raw material producer, or the manufacturer of the chemical building product based on the raw material producer's information, must certify that there is no naphtha classified as Acute Tox. Cat. 1-4 in the product. Naphtha is used in chemical building products such as paints and varnishes.

Naphthas are largely excluded by requirements concerning classification of constituent substances and restricted by the VOC requirement (boiling point lies between 20ºC and 75ºC).

Bisphenol A

Nordic Ecolabelling has chosen not to set a separate requirement that bisphenol A (CAS no. 80-05-7) must not appear in raw materials or products, since bisphenol A is excluded from use in this requirement due to its classification as toxic for reproduction – H361f. Bisphenol A is also classified as H335, H318, H317as well as being included on the 2009

[25] Wikipedia.org - http://en.wikipedia.org/wiki/Naphtha
[26] http://en.wikipedia.org/wiki/Naphtha

"effect list" from the Danish Environmental Protection Agency[27], a list of undesirable substances, and on the EU's list of endocrine disruptors, and is therefore not permitted in ecolabelled chemical building products. Bisphenol A combined with epichlorhydrin* (CAS no. 106-89-8) may be found in some sealants together with epoxy resins such as bisphenol A epichlorhydrin epoxy resin (CAS no. 25068-38-6) classified as H319, H315, H317, H411. Epoxy resins are not directly excluded by the requirements for constituent substances or other unique requirements concerning constituent substances, but have a starter substance that is covered by these requirements and are thus excluded by this.

** Epichlorhydrin/1-chloro-2,3-epoxypropane (CAS no. 106-89-8) is classified as H226, H350, H331, H311, H301, H314, H317.*

An exemption has been made, after the public consultation period, for very small amounts of Bisphenol A from the raw materials in the polymers used in epoxy paints. The exemption means that up to 5ppm Bisphenol can be used in the final epoxy paint. This will make it possible to ecolabel the environmentally best epoxy paints, since the amounts of Bisphenol are much higher than 5ppm in other products. The benefits of epoxy paints are amongst others that they have good scratch resistance, corrosion protection and create a barrier to moist in materials. Nordic Ecolabelling finds the benefits with epoxy paints to be high enough to accept the small amounts of Bisphenol A, as described above, in them.

Toluene
Nordic Ecolabelling has chosen not to set a separate requirement excluding toluene from use in raw materials or products, since toluene is excluded in this requirement due to its classification. Toluene is classified as H225, H361d, H304, H373, H315 and H336 . Toluene must therefore not be added to chemical building products.

Preservatives
Preservatives are used in the products to avoid microorganisms growing in the product and also later to protect the finished surface. Protecting products and surfaces from microbial growth is one way of ensuring that the products have a long lifetime both on the shelf and later when paints, for example, are on a house wall.

Preservatives are exempted from this requirement when they are used to preserve the product and they are not subject to any of the risk phrases H373, H334, H370, H341 or combinations of these. It is necessary to have an exemption for preservatives, since in the experience of Nordic Ecolabelling preservatives for paints and so on commonly have these risk phrases and cannot be replaced. One example of a preservative used in the paint industry is IPBC (iodopropynyl butylcarbamate), whose classifications include H302 (see the ECHA website for detailed information). See also restrictions on preservatives under O5, where IPBC, isothiazolinone and CMIT/MIT are restricted.

Formaldehyde (CAS no. 50-00-0)
Formaldehyde is a toxic and allergenic substance (H317) that has carcinogenic effects (H351) and should therefore be avoided as far as possible. Formaldehyde is exempted from the requirement where the formaldehyde appears in the form of impurities in newly produced polymers. The reason for this is that, in Nordic Ecolabelling's experience, newly produced polymers may contain impurities in the form of formaldehyde. Products must

[27] http://www.mst.dk/Virksomhed_og_myndighed/Kemikalier/Stoflister+og+databaser/effektlisten/ (visited 14.01.2013)

not, however, have actively added formaldehyde or formaldehyde-releasing substances, see more under O6.

Methanol
Methanol (CAS no. 67-56-1) is an alcohol that is classified as acutely toxic – H301, H311, H331 and H370. Certain types of sealant require methanol as a constituent substance and/or as a degradation product. Such sealants are for example used to attach "non-absorbing" materials on an absorbing material (e.g. a mirror on a plaster material). If two materials are to be attached to each other where neither one of them is absorbing it is not possible to use a waterborne product since the non-absorbing materials will not be able to release the water during hardening. Products containing small amounts of methanol or releasing methanol can however be used when a mirror is to be attached on a wooden wall and then also have the advantage to be more elastic and therefore will be able to handle the movement of the wall better than the hard waterborne sealant. In this version, Nordic Ecolabelling has made an exemption for maximum 0.10% methanol in freshly produced sealants, in order to allow sealants to meet this requirement. Sealants make up a very small proportion of the material in a room, which naturally keeps the quantities low. A filler used on a whole wall, for example, would represent a much larger surface for degradation and the exemption is therefore restricted exclusively to sealants. See also O5 for adjustments made for sealants in the area of preservatives.

The methanol content and quantity of methanol formed during hardening (as a degradation product) are restricted such that sealant may contain up to 0.10% methanol. The limit of 0.10% has been set on the basis of discussions with the industry on how much methanol can be found in the products and how much is produced during hardening.

It was in September 2014 decided to expand the exemption for methanol to Construction adhesives at the same level as sealants. Construction adhesives refer to adhesives used on non-absorbing substrates, such as metals and glazed surfaces. Construction adhesives are used on smaller surfaces, like for example mounting mirrors.

Respirable crystalline silica/quartz
Respirable crystalline silica/quartz is present as an impurity in most mineral fillers and contribute to the amounts in the final product to be above 100ppm, which is the general impurity limit. Respirable silica is classified as STOT RE 1 (H372)[28]. When the respirable silica has been mixed into the wet paint it is no longer respirable (i.e. do not have the properties as STOT RE 1) neither in the dry paint film, since the silica is bound to larger particles. Silica does not cause health issues in the final product, since it isn't in dry powder form. To make it possible for the producers of paint, fillers and so on to produce products containing these fillers, an exemption is made from the classification with H372 for respirable silica up to 1% in the raw materials. The powder raw material also needs to fulfil requirement O10 regarding constituent powder substances, where the producer has to take on action to limit the dust in the production.

Driers
Driers in paints that contains alkyd based binders and classified as toxic for reproduction category 2 are excluded from the requirement on classification until 30 November 2016 for outdoor paints (both consumer and industrial paints) and until 30 November 2015 for industrial indoor paints. The total amount of drier classified as toxic for reproduction

[28]Crystalline silica: http://www.crystallinesilica.eu/content/classification-and-labelling-rcs#rcs

category 2 in the paint shall be less than 0.3%. The exemption does not include substances/compounds on EU:s Candidate list.

The background for this limited exemption is to give producers a time window to substitute these driers and to drive the producers towards using less harmful driers. Many of the driers classified as toxic for reproduction category 2 have recently been reclassified as toxic for reproduction category 2. The reason for the relatively long exemption is that it takes long time to perform the quality controls for outdoor paint. The paints are to be outdoors for approximately 12 months before the quality test can be finalized.

Nordic Ecolabelling decided to update the requirement on 12 August 2015, so that only the CLP regulation is valid. A clearification regarding vinyl acetate was also made.

Nordic Ecolabelling decided to update this requirement on February 17 2016 to include the following exemptions:

- Neutralizing agents
- Sodium nitrite
- Glyoxal

The background for these exemptions are described here:

Glyoxal
Glyoxal CAS#: 107-22-2 is classified as mutagenic cat 2 (H341). Glyoxal is often present in cellulose based products. There are alternative ways to make technical adaptions to the process which makes it possible to use cellulose without glyoxal, but unfortunately it is difficult to obtain enough of these alternative raw materials, at least at the present time.

Therefore an exemption has been made to allow the use of glyoxal, if the pH of the final product is above 8. When the pH is above 8 in an aqueous solution the glyoxal reacts to irreversibly form glycolic acid CAS#: 79-14-1. Glycolic acid is not classified with H341, but is classified H332 and H314. Therefore allowing the use of glyoxal will not generate substance classified with H341 in the final product.

Sodium nitrite
Sodium nitrite (CAS#: 7632-00-0) is classified as acute tox 3 (H301) and aquatic acute 1 (H400) and also H272 and H319. In food sodium nitrite is used to maintain colours and prevent bacterial growth.

Sodium nitrite is used in paint as a corrosion protection when painting on metal surfaces and it may also have in-can preservative effect.

Sodium nitrite is assessed as relatively harmless, as it is approved for food, and therefore below 0.1% by weight totally in the final product is allowed. However, requirement O2 must still be fulfilled.

This requirement was updated on June 1 to exempt driers.

Driers
Driers are used in oxidative drying paints, such as alkyde based paints for both indoor and outdoor usage. Driers are needed to make the paint dry quickly and to avoid it to be sticky and sensitive to touch. Driers work as catalysts, ie they start a reaction but are not

consumed in the reaction. There are driers classified with STOT RE 2: H373 and/or Acute Tox 3: H301 and they are now exempted if the total amount is < 0,10% in the final product. Cobalt driers have been used earlier in the same types of paints, but since they have been classified as Rep tox cat 2 they are no longer accepted in the Nordic Ecolabelled indoor paints.

In November 2016, the Nordic Ecolabelling Board decided to allow classification of acute tox: Different Nordic Ecolabel criteria for chemical products are very different in terms of the classifications that are allowed on the ingredients. Classification of acute toxicity is only prohibited in chemical construction products and indoor paints. This has led to many exemption as several substances used in these products classifies with acute tox. The requirement O3 has been adjusted so that it is in line with other chemical products criteria. Several exemptions have also been removed from the requirement. The requirement on acute toxicity at the product level is retained.

In March 2017, the Nordic Ecolabelling Board decided to allow classification of acute tox: As for classification with acute toxicity, specific target organ toxicity is only prohibited in chemical construction products and indoor paints. The requirement O3 has been adjusted so that it is more in line with other chemical products criteria. One exemption was also been removed from the requirement. The requirement on specific target organ toxicity at the product level is retained.

In May 2020, the Nordic Ecolabelling Board decided to allow the use of the dispersant trimethylol propane (TMP) classified as H361fd. TMP was self-classified by the manufacturer after a compliance review in accordance with REACH and is valid from April 2020. The purpose of the substance is to increase the spreadability of pigments and counteract lumps, and can be correlated to the fact that less paint needs to be used to cover a surface and provide a decorative layer. As TMP does not have an official harmonized classification, it was decided in May 2020 to introduce a time-limited exemption of up to 1% in pigments until 2022-05-31 to give raw material producers and licensees time to look for alternative dispersants.

On February 18, 2020, the European Commission published the decision that TiO2 will be classified as a suspected carcinogen (Category 2) upon inhalation under the CLP Regulation. The classification has been met with criticism because the risk that gives rise to the hazardous property according to CLP concerns inhalation and powder form and not the substance itself.

The classification of titanium dioxide as carcinogenic by inhalation is only applicable to mixtures in the form of powders containing at least 1% of titanium dioxide particles which are in the form of or incorporated into particles having an aerodynamic diameter of ≤ 10 μm. This means that if TiO2 or TiO2 mixtures are not in this specific form, the classification does not apply. The classification means that the use of TiO2 as a raw material goes against the Ecolabel's definition of constituent substances.

Liquid and certain solid mixtures are not classified, which is why Nordic Ecolabelling has made an exception for the use of titanium dioxide in wet products. The criteria already have a requirement regarding handling and exposure of powdered raw materials at the manufacturer. As a result of the classification, specific warning instructions and labels must be applied to the products containing more than 1% TiO2. Nordic Ecolabelling has therefore introduced an additional requirement in requirement O9 Titanium dioxide to

ensure that the TiO2 risks that give rise to its classification are controlled and also documented from the raw material producer.

O3 Requirement text:

The product must not contain chemical substances that are or may degrade into substances that are classified as carcinogenic (Carc), mutagenic (Mut), toxic for reproduction (Rep), airway sensitising, acute toxic or specific target organ toxicity with repeated exposure according to CLP Regulation (No) 1272/2008.

Table 2 Classification of constituent substances

Classification according to CLP Regulation 1272/2008	
Hazard class and category	**H-phrase**
Carcinogenic Category Carc 1A/1B/2	H350, H350i, H351
Mutagenic Category Mut 1A/B/2	H340, H341
Toxic for reproduction Repr 1A/1B/2	H360, H361, H362
Airway sensitising	H334
Specific target organ toxicity with repeated exposure STOT SE 1 STOT RE 1	H370, H372

Note that the manufacturer is responsible for correct classification.

Exemptions:

- Vinyl acedate as residual monomer in polymers (limied to max 1000 ppm in requirement O7).
- Preservatives that are used to preserve the product are exempted from the requirement of classification as specific target organ toxicity with repeated exposure, category 1 (further requirements concerning preservatives are stated in O5).
- Formaldehyde as an impurity in newly produced polymers, see separate requirement O6.
- Freshly produced sealants and construction adhesives* may contain methanol to a maximum level of 0.10%.
- Respirable crystalline silica/quartz is exempted from the classification as STOT RE 1 with H372. Respirable crystalline silica can be up to 1% in the raw material, see requirement O10 regarding constituent powder substances.
- Bisphenol A up to 5ppm in epoxy paints are exempted.
- Glyoxal (CAS#: 107-22-2) up to maximum 100 ppm in the final product if the pH is above 8 in the final product.
- The dispersant trimethylol propane (CAS #: 77-99-6) self-classified as H361 in up to 1% in pigments. Time-limited exception valid until 2022-05-31.
- Titanium dioxide (TiO2) which is added in powder form during raw material production (additional requirements for TiO2 is stated in O9).

** Construction adhesives refers to adhesives used on non-absorbing substrates, such as metals and glazed surfaces. Construction adhesives are used on smaller surfaces, like for example mounting mirrors.*

✉ Declaration in line with Appendices 1 and 2 from the manufacturer of the product and the manufacturer of each raw material. Documentation of exemptions for each

substance is done on appendix 1 and 2, together with a statement why the substance is present in the product/raw material. If methanol is included in sealants it must be documented with test results.

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

O4 Environmentally harmful substances

Many chemical building products contain substances that are classified as toxic to aquatic organisms – H410, H411 and/or H412 – as supported in a study by Norway's National Institute of Technology[29]. Such substances are restricted and may only appear in small quantities in ecolabelled products. The purpose of restricting environmentally harmful substances is to reduce the ability for such substances to be emitted to water, for example when washing brushes and tools.

The evaluation conducted in 2012 pointed out that the limit for environmentally harmful substances could be tightened in version 2, since the licence data proved to be considerably lower than the previous limit of 0.7 (version 1). For the revision, the project group has chosen to tighten the limit, since the levels if the raw materials that previously been handled within the Nordic Ecolabelling indicates the possibility to tighten this requirement. The new requirement mainly relates to CLP (new classification in the EU) which makes the formula look a little different in this context. The choice not to tighten the requirement even more was also made against the background that aquatic toxicity is not as relevant for chemical building products as it is for many other chemical products (such as laundry detergents and cleaning products) that always end up in the aquatic environment after use. Chemical building products end up in the aquatic environment when brushes, tools and suchlike are cleaned in water and when products in outdoor environments slowly leach out/evaporate, but a large proportion of the residues of chemical building products end up in the waste management system and are incinerated. The new limit is more in line with how much environmentally hazardous substances there are in the chemical building products on the market today.

The formula for calculating environmentally harmful substances is based on the classification rules for environmentally harmful substances[30], but with a tougher limit value. The formula is as follows:

M*100*H410 + 10*H411 + H412 ≤ 11%

Where:

H410 is the concentration of substances classified with H410 in percent

H411 is the concentration of substances classified with H411 in percent

H412 is the concentration of substances classified with H412 in percent

Where M is the multiplying factor31 for H410 linked to the substance's LC50 or EC50 value, in accordance with Table 4.2.1 below. I.e., if a substance is classified as H401 and has LC50= 0.05, then M=10.

[29] National Institute of Technology, Miljøkrav til kjemiske byggprodukter, 2007
[30] CLP Regulation (Table 4.1.2): http://echa.europa.eu/documents/10162/13562/clp_en.pdf
[31] Table 4.1.3 in the CLP Regulation, http://echa.europa.eu/documents/10162/13562/clp_en.pdf

For substances classified as H410 the table 4.2.1 below is to be used to find the multiplication factor by finding the LC/EC50-value. See the example below the table.

Table 4.2.1. Concentration limits and multiplying factors for substances classified as H410

Acute toxicity		**Chronic toxicity**		
L(E)C50 value (mg/l)	**M-factor**	**NOEC value (mg/l)**	**M-factor non readily biode-gradable substances**	**M-factor readily biode-gradable substances**
0,1 < L(E)C50 ≤ 1	1	0,01 < NOEC≤0,1	1	-
0,01 < L(E) C50 ≤ 0,1	10	0,001 < NOEC≤0,01	10	1
0,001 < L(E) C50 ≤ 0,01	100	0,0001 < NOEC≤0,001	100	10
0,0001 < L(E) C50 ≤ 0,001	1000	0,00001 < NOEC≤0,0001	1000	100
0,00001 < L(E) C50 ≤ 0,0001	10 000	0,000001 < NOEC≤0,00001	10 000	1000
Continues with factor 10 intervals		Continues with factor 10 intervals		

According to the classification rules, if the result of the formula is 25%, the substance is classified as environmentally harmful – H410. Nordic Ecolabelling's limit of 11% amounts to 44% of the classification limit. In version 1, the corresponding limit was 70% of the classification limit. The requirement is made about 35% more stringent than in version 1.

For clarification on how this formula works, see the following example:

A raw material contains substances classified as environmentally harmful as follows:

0.01% H410, where LC50=0.05

0.05% H411

0.1% H412

For H410 you can then see in the table in the requirement that the classification limit at LC50 between 0.01 and 0.1 is 0.025%, i.e. M (multiplying factor) =10. The result of the calculation using the formula is thus:

*((10*100*0.01) + (10*0.05) + 0.1) = 10.6%*

The raw material fulfils the requirement.

As well as a weighting formula, version 1 also had a limit for how much of each substance classed as environmentally harmful was permitted and the sum of the substances. However, since the weighting formula and the other requirement overlap each other, in this version Nordic Ecolabelling has chosen only to set the requirement relating to the weighting formula, as the new limit restricts levels that may be found in the products by more than the previous version.

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

The Nordic Ecolabelling Board decided 25 February to include an exception in requirement O2 and in O4 (for IPBC). For further background, see O2.

The Nordic Ecolabelling Board decided 16 June to include an exception in requirement O4 Isothiazolinone compounds and Zinc pyrithione (CAS# 13463-41-7) due to reclassifications as a consequence och the implementation of the CLP-Regulation.

The Nordic Ecolabelling decided in June 2019 to harmonize the requirement with the criteria for indoor paints and varnishes and thus exclude preservatives from the requirement.

The Nordic Ecolabelling decided in June 2020 to exempt zinc and zinc compounds in two-component products for anti-corrosion paint for industry and infrastructure. The dcision is justifiedby the fact that there is steerability to reduce leaching of environmentally hazardous substances. Since only professionals are allowed to use the products, there is steerability regarding work environment rules so the risk of incorrect handling is minimal.

O4 Requirement text:

Constituent chemical substances classified as environmentally harmful with risk phrases H410, H411, H412, according to CLP Regulation (No) 1272/2008, are limited in the product according to the following formula (calculation model taken from current classification rules, except that here the limit value is tougher):

M*100*H410 + 10*H411 + H412 ≤ 11%

Where:

H410 is the concentration of substances classified with H410 in percent

H411 is the concentration of substances classified with H411 in percent

H412 is the concentration of substances classified with H412 in percent

Where M is the multiplying factor for H410 linked to the substance's LC50 or EC50 value, read in accordance with Table 3 below (from the CLP classification rules).

Table 3 Concentration limits and multiplying factors for substances classified as H410

Acute toxicity		**Chronic toxicity**		
L(E)C50 value (mg/l)	**M-factor**	**NOEC value (mg/l)**	**M-factor non readily bio-degradable substances**	**M-factor readily biodegradable substances**
0,1 < L(E)C50 ≤ 1	1	0,01 < NOEC≤0,1	1	-
0,01 < L(E) C50 ≤ 0,1	10	0,001 < NOEC≤0,01	10	1
0,001 < L(E) C50 ≤ 0,01	100	0,0001 < NOEC≤0,001	100	10
0,0001 < L(E) C50 ≤ 0,001	1000	0,00001 < NOEC≤0,0001	1000	100
0,00001 < L(E) C50 ≤ 0,0001	10 000	0,000001 < NOEC≤0,00001	10 000	1000
Continues with factor 10 intervals		Continues with factor 10 intervals		

If information about a substance's harmfulness to the environment (in the form of data concerning toxicity and degradability or toxicity and bioaccumulation) is not available, the substance is treated as a worst case, i.e. as environmentally harmful – H410, and multiplication factor 1000.

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

Preservatives are exempted from the requirement. Requirements O2 and O5 must still be fulfilled.

Zinc and zinc compounds in two-component products are exempted from the requirement in anti-corrosion paint for industry and infrastructure.

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

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

☒ Calculation clearly showing that the requirement is fulfilled.

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. In some products preservatives are also added as film preservatives, i.e. to avoid attacks of algae, mould and similar on the film.

Levels of preservatives such as MIT (methyl-isothiazolinone) and other isothiazolinones are largely driven by the kind of preservation the unique raw materials in the product require. In this product group, the preservation of binders has proven to have a crucial effect on the concentration of preservatives in the end product. Quantities of preservatives depend on the type of binder that is needed for the specific product.

Bioaccumulation

Preservatives are generally toxic to aquatic organisms and can cause hypersensitivity and allergies. Preservatives may be used in the products and in constituent substances only if they are not bioaccumulative.

Bioaccumulative substances collect in the fat tissue of living organisms and can cause long-lasting damage to the environment.

Unless otherwise proven, substances are considered to be bioaccumulative if:

- logKow ≥ 4.0, in line with the OECD's guidelines 107 or 117 or equivalent.
- If the substance has a biological concentration factor (BCF) ≥ 500, when tested according to OECD 305 A-E, the substance is considered to be bioaccumulative, and if the BCF < 500 the substance is considered not to be bioaccumulative.

If there is a measured BCF value, it is always the highest measured BCF that is used in assessing a substance's bioaccumulative potential.

The limit values for logKow and BCF have been amended in line with GHS.

Isothiazolinone compounds

Isothiazolinones are used as a preservative in many products, where they act as fungicides, biocides and algal growth inhibitors. They are, however, toxic to aquatic organisms and they have varying degrees of sensitising effect. Nordic Ecolabelling wishes to limit the use of isothiazolinones on the grounds of their environmental and health profile. In general terms, it has been common to preserve chemical building products using formaldehyde and/or formaldehyde-releasing substances. From this perspective, MIT and other isothiazolinones are more part of the solution than they are a problem, since the sensitising risks of isothiazolinones are considerably less than the risks of using carcinogenic formaldehyde and formaldehyde-releasing substances.

On October 4, 2018, MIT received a harmonized classification[32] published in ATP 13, where the classification comes into force May 2020. This applies to a specific concentration limit of 0,0015% as Skin sens. 1. This means that products containing >0,0015% of MIT will be labelled as H317. Since the criteria do not allow H317 on in-can preservation, Nordic Ecolabelling has chosen to change the requirement limit for the isothiazolinone MIT from 100 ppm to 15 ppm to equate the substance with the requirement of CMIT/MIT.

There is an ongoing discussion on preservatives with focus on MIT. Many of the discussions[33] refer to the risks of allergies with MIT. Nordic Ecolabelling has in this version chosen to limit all isothiazolinones as a group, and not just MIT, since they are known to have sensitising effects and that isothiazolinones often occur in combinations in the products.

Isothiazolinones are often used in blends, where several different variants go into the same products. The requirement therefore steers the total amount of isothiazolinones and not individual isothiazolinone compounds (e.g. MIT). The requirement limits in version 1 are generally seen (by manufacturers) as tough and several manufacturers have had difficulty fulfilling the preservatives requirement.

5-chloro-2-methyl-2H-isothiazol-3-one and 2-methyl-2H-isothiazol-3-one (3:1) (below referred to as CMIT+MIT (3:1))

The isothiazolinone blend of 5-chloro-2-methyl-2H-isothiazol-3-one (CAS no. 26172-55-4) and 2-methyl-2H-isothiazol-3-one (CAS no. 2682-20-4) (3:1) has been more strictly limited because this blend is highly allergenic (H314 and H317) and environmentally harmful (H400 and H410). The limit is 15 ppm (0.0015% by weight, 15 mg/kg) in Nordic Ecolabelled chemical building products for all categories. The limit of 15 ppm was the limit that gave the risk phrase "Contains XX, may cause an allergic reaction" according to the Dangerous Substances Directive. With CLP this limit is lowered to 1.5 ppm for CMIT/MIT. Nordic Ecolabelling has however chosen to maintain the limit of 15ppm for this mixture since that is the amount where you also can get a preservative effect. With additions as low as 1.5ppm of CMIT/MIT will not give a good preserving effect.

Adhesives and sealants

There are currently no Nordic Ecolabelled sealants and the reason for that appears to be too strict a requirement concerning isothiazolinones for waterborne sealants and reference to a poor TVOC measurement method. Since binders (the raw materials that contain most isothiazolinones) used in 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. The limit of 100 ppm[34] means that sealant (and adhesive) packaging is not labelled "Contains isothiazolinone, may cause an allergic reaction" at the moment, nor will it be when CLP for products enters into effect in June 2015. Under requirements for classification of products, the label "Contains isothiazolinone, may cause an allergic reaction" is also prohibited, see O2.

In addition, 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. The easing of

[32] 13th ATP: https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32018R1480&from=EN
[33] DR, Alvorlig allergi truer håndvær: http://www.dr.dk/Nyheder/Indland/2014/01/08/235129.htm
[34] The limit at which the label must carry the warning "Contains isothiazolinone, may cause an allergic reaction" is 1000 ppm (0.1%) for substances classified as Skin Sens 1 or 1b, and 100 ppm (0.010%) for Skin sens 1a.

the requirement will not affect the end user to a greater degree than when applying adhesive. 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 O31 on consumer information and recommendations.

When the product group was expanded with multipurpose adhesives/construction adhesives, it was estimated that the limit values for adhesives are suitable for multipurpose adhesives/construction adhesives as well.

Fillers
Fillers have a great deal in common with indoor paints in terms of polymers and the fact that they contain natural materials that actively add microorganisms to the product. The limit of 500 ppm isothiazolinone compounds is the same as in the requirements for indoor paints. In the EU Ecolabel's new criteria for paint (decided in November 2013) the limit for in can preservatives is 0.060% for indoor paints, i.e. a bit higher than this limit on 0.050%.

Outdoor paints and varnishes (manual application)
For products in the category outdoor paints and varnishes, the content of isothiazolinone compounds in the product may be up to 1500 ppm, which is because there is a need to preserve both the product and the dry film. An amount of preservatives on this level of isothiazolinones means that the product is classified as H317 or that the following text is required on the packaging: "Contains (name of sensitising substance), may cause an allergic reaction". An exemption from this has been made in O2, see above.

If the product is classified as H317 or "Contains (name of sensitising substance), may cause an allergic reaction" and contains more than 500 ppm isothiazolinones the manufacturer must show that the product and the dry film pass microbial growth tests as set out in O23. The level of isothiazolinones permitted in outdoor paints is also higher than in exterior products than in interior products to be able to protect the film against attacks and that the risks of allergies is lower during outdoor application than indoor. In this context, preservatives refers both to "in can" preservatives (i.e. in the paint in the tin) and film preservatives. The limit for the microbial growth test has been set at above 500 ppm of isothiazolinones to avoid forcing microbial growth tests if the preservative is added as in can preservative, which often is the case when the amount of preservative is below 500 ppm.

IPBC (iodopropynyl butylcarbamate, CAS no. 55406-53-6) is mainly used in paint products either as a single fungicide or in combination with others for increased and long-lasting protection against growth. The substance is used for surface protection at levels <1%, mainly in wood paints, wetroom adhesives and to some extent in fillers. IPBC is often used instead of the isothiazolinone DCOIT (4,5-dichloro-2-octyl-2H-isothiazol-3-one, CAS no. 64359-81-5) or instead of formaldehyde-releasing preservatives, which have similar technical properties. The fungicide IPBC was assessed as part of the development work for REACH and the EU's Biocidal Products Directive (98/8/EC). According to the ECHA webpage IPBC is to be classified with H302, H334, H318, H317, H372, H400 and H410. The substance will be discussed for harmonised classification in the beginning of 2014. Exemptions are made for preservatives in O3.

The limit is based on the fact that although more IPBC is required than isothiazolinone to achieve the same preservative effect, IPBC is less allergenic than isothiazolinone. The limit

for IPBC is therefore higher than for isothiazolinone. The limit of 4500 ppm remains unchanged from version 1.

There is, however, an addition limit of 5000 ppm for the total amount of isothiazolinone and IPBC for outdoor paints. This limit was also in version 1 of the criteria and means that a product cannot be labelled if it has the maximum level of isothiazolinone and IPBC.

Comments during the public consultation period have shown an interest in using IPBC in other categories than just exterior paints, for example in tinting pastes and adhesives. Limits for IPBC have therefore been included in all subcategories. The levels have been set according to information from raw material suppliers.

Paints and varnishes and varnishes for industrial use (exterior and interior)
Products in the category industrial paints and varnishes (indoor) may contain preservatives in the form of isothiazolinones. The level is restricted to 500 ppm, which is the same limit as for fillers and for EU Ecolabelled indoor paints.

The limits for industrial products to be used for exterior products, the limits for isothiazolinones, IPBC and CMIT/MIt have been set as the same for manually applied exterior paints.

The amount of preservative required in indoor paints is lower than for outdoor paints, as it generally takes less preservative to prevent growth in the finished film indoors.

With the expansion with impregnating agents for tile, stone and concrete, requirements have been set for the amount of preservatives. Some tile and facade impregnants do not require preservatives, while for others, preservatives are used. Preservatives are often classified as hazardous to the environment. When impregnating agents for tile, stone and concrete, there is a great risk that part of the impregnating agents will be spilled on the surrounding soil and therefore it is desired to limit the amount of preservatives. 2-Methyl-3,2H, -isothiazolone (MI) has been reclassified and given a specific concentration limit for Skin Sens. 1A; H317: C ≥ 0,0015 %. MI must be used in amounts greater than 15 ppm to give a coercive effect. It is not desired that Nordic Ecolabelled chemical building products be classified as sensitizing and/or environmentally harmful, therefore MI is not allowed.

Preservatives in impregnating agents for tile, stone and concrete are allowed in small amounts, isothiazolinone compounds at a total maximum of 100 ppm, and a maximum of 15 ppm of CMIT + MIT (3: 1).

The Nordic Ecolabelling decided in June 2019 to harmonize the requirement for preservatives with the criteria for indoor paints and varnishes and thus exclude preservatives from the requirement. At the same time maximum limits for the total amount of preservatives were added.

O5 Requirement text:

- No preservatives added to the product or its ingredients may be bioaccumulative.

The bioaccumulative properties of a substance can be tested on fish in line with OECD test method 305 A-E. If the bioconcentration factor (BCF) is ≥ 500, the substance is considered to be bioaccumulative. If there is no BCF for a substance, that substance is considered to be bioaccumulative if logKow ≥ 4 under the OECD's guidelines 107 or 117 or equivalent.

Note that if there is a measured BCF value and a logKow value, it is always the highest measured BCF that is used, rather than the logKow value.

- The total levels of isothiazolinone compounds, iodopropynyl butylcarbamate (IPBC) and 3:1 blends of 5-chloro-2-methyl-2H-isothiazol-3-one and 2-methyl-2H-isothiazol-3-one (here called CMIT+MIT (3:1)) must not exceed the limit values in Table 4 below:

Table 4. Restrictions on preservatives

	The highest amount allowed of each preservative/combination of preservatives are limited according to the following:					
	Isothiazolinone compounds	**Iodopropynyl butylcarbamate (IPBC)**	**IPBC + iso-thiazolinone**	**CMIT+MIT (3:1)** 5-chloro-2-methyl-2H-isothiazol-3-one (CAS 26172-55-4) and 2-methyl-2H-isothiazol-3-one (CAS 2682-20-4) in blends with ratio 3:1	**MIT** 2-methyl-2H-isothiazol-3-one (CAS 2682-20-4)	**Total amount of preservatives**
Adhesives and sealants, incl. multipurpose adhesives/construction adhesives	100 ppm (0.01% by weight, 100 mg/kg)	2000 ppm (0,2% by weight, 2000 mg/kg)	2100 ppm (0,21% by weight, 2100 mg/kg)	15 ppm (0.0015% by weight, 15 mg/kg)	15 ppm (0.0015% by weight, 15 mg/kg)	2700 ppm (02700 by weight, 2700 mg/kg)
Fillers	500 ppm (0.05% by weight, 500 mg/kg).	2000 ppm (0,2% by weight, 2000 mg/kg)	2500 ppm (0,25% by weight, 2500 mg/kg)	15 ppm (0.0015% by weight, 15 mg/kg)	15 ppm (0.0015% by weight, 15 mg/kg)	3100 ppm (0,3100 by weight, 3100 mg/kg)
Outdoor paints and varnishes	1500 ppm (0.15% by weight, 1500 mg/kg)*.	4500 ppm (0.45% by weight, 4500 mg/kg)**.	5000 ppm (0.50% by weight, 5000 mg/kg).	15 ppm (0.0015% by weight, 15 mg/kg)	15 ppm (0.0015% by weight, 15 mg/kg)	6700 ppm (0,6700 by weight, 6700 mg/kg)
Industrial paints and varnishes for indoor products	500 ppm (0.05% by weight, 500 mg/kg).	2000ppm (0,20% by weight, 2000 mg/kg)	2500ppm (0,25% by weight, 2500 mg/kg)	15 ppm (0.0015% by weight, 15 mg/kg)	15 ppm (0.0015% by weight, 15 mg/kg)	3100 ppm (0,3100 by weight, 3100 mg/kg)
Industrial paints and varnishes for outdoor products	1500 ppm (0.15% by weight, 1500 mg/kg)*	4500 ppm (0.45% by weight, 4500 mg/kg)**	5000 ppm (0.50% by weight, 5000 mg/kg)	15 ppm (0.0015% by weight, 15 mg/kg)	15 ppm (0.0015% by weight, 15 mg/kg)	6700 ppm (0,6700 by weight, 6700 mg/kg)
Impregnating agents for tile, stone and concrete	100 ppm (0,0100 by weight, 100 mg/kg)***	Not allowed	-	15 ppm (0,0015 by weight, 15 mg/kg)	15 ppm (0.0015% by weight, 15 mg/kg)	600 ppm (0,0600 by weight, 600 mg/kg)
Anti-corrosion paint for industry and infrastructure	Not allowed	Not allowed	Not allowed	Not allowed	Not allowed	Not allowed

**If the content of izothiazolinones is >500 ppm and causes classification with H317 or the phrase "Contains (name of sensitising substance), may cause an allergic reaction", the requirements for weathering tests for growth in O23 needs to be fulfilled.*

*** If the content of Iodopropynyl butylcarbamate (IPBC) causes classification with H317 or the phrase "Contains (Iodopropynyl butylcarbamate (IPBC)), may cause an allergic reaction", the requirements for weathering tests for growth in O23 needs to be fulfilled.*

**** 2-Methyl-3,2H,-isothiazolone (MI, CAS 2682-20-4) is not allowed to be added to impregnating agents for tile, stone and concrete*

The term preservative refers to both preservatives for tinned products and preservatives for the surface finish.

☒ Documentation that none of the added preservatives are bioaccumulative, cf. OECD test method no. 305 A-E or 107, 117.

☒ Duly completed declaration, see Appendix 2, from the manufacturer of each raw material.

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

O6 Formaldehyde

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

Formaldehyde is permitted as an impurity in newly produced polymers since, in Nordic Ecolabelling's experience; newly produced polymers may contain residual monomers in the form of formaldehyde. Products must not, however, have actively added formaldehyde (CAS no. 50-00-0) or formaldehyde-releasing substances.

The Nordic Ecolabelling's Criteria Group decided March 15 2018 to make an adjustment to O6 regarding formaldehyde releasing substances to harmonize with the requirement in indoor paints (096). An additional text was added to clarify that this is not in accordance to the definition of ingoing substances regarding formaldehyde releasing agents, ie this exemption is only in this requirement. This means that for example bronopol can be used in the products as long as the total level of free formaldehyde in the final product is below the limit of 10 ppm.

For paints and fillers, the permitted impurity is maximum 200 ppm (0.02% by weight, 200 mg/kg) formaldehyde, on condition that the content of free formaldehyde in the end product does not exceed 10 ppm (0.001% by weight, 10 mg/kg). For adhesives and sealants, the permitted impurity is maximum 250 ppm (0.025% by weight, 250 mg/kg), on condition that the content of free formaldehyde in the end product does not exceed 10 ppm (0.001% by weight, 10 mg/kg). The limit values are related to the licence data that Nordic Ecolabelling has on the different subgroups. When the product group was expanded with multipurpose adhesives/construction adhesives, it was estimated that the limit values for adhesives are suitable for multipurpose adhesives/construction adhesives as well.

The detection limit for the Merckoquant method is 10 ppm, while the VdL-RL 03 method ("Concentration of free formaldehyde determined using the acetyl-acetone method") has a detection limit of 100 ppm. It is therefore stated that use of the VdL-method must prove there is less than 100 ppm in the product.

O6 Requirement text:

Products must not contain actively added formaldehyde (CAS#: 50-00-0).

Note that the definition of ingoing substances has been waived regarding potential formaldehyde releasing substances.

The level of free formaldehyde (from formaldehyde not intentionally added or from formaldehyde-releasing substances) in the end product must not exceed 10 ppm (0.001% by weight, 10 mg/kg)*.

In fillers and paint products, formaldehyde is permitted as an impurity in newly produced polymers at a concentration of no more than 200 ppm (0.02% by weight, 200 mg/kg)**, on condition that the content of free formaldehyde in the end product does not exceed 10 ppm (0.001% by weight, 10 mg/kg)*.

In adhesives, sealants and multipurpose adhesives/construction adhesives, formaldehyde is permitted as an impurity in newly produced polymers at a concentration of no more than 250 ppm (0.025% by weight, 250 mg/kg)**, on condition that the content of free formaldehyde in the end product does not exceed 10 ppm (0.001% by weight, 10 mg/kg)*.

**Measured with the Merckoquant method (appendix 2 to RAL-UZ 102) or other equivalent test method.*

***Measured with the VdL-RL 03-method "In-can concentration of formaldehyde determined by the acetyl-acetone method" or the Merckoquant method (appendix 2 to RAL-UZ 102) or other equivalent test method.*

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

✉ Statement on the levels in the product (if any) as measured using the Merckoquant method (see appendix 2 to RAL-UZ 102). The measurement can also been done according to the VdL-RL 03 method ("Concentration of free formaldehyde determined using the acetyl-acetone method", according to which the measured concentration can not be above 100 ppm). Other equivalent test methods can be used.

✉ The test laboratory must fulfil the requirements in appendix 5.

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 total level of residual monomers in the polymer. The requirement states that newly produced polymers may contain a maximum of 100 ppm residual monomers if these have properties that are very toxic, toxic or harmful to health, and are classified as Acute Tox. Cat. 1-4. 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 is set at 100 ppm based on licence data. The limit remains unchanged from version 1.

Exemption vinyl acetate

Vinyl acetate (CAS nr 108-05-4) is used in polymer dispersions in for example waterborne adhesives. In this type of products it vinyl acetate is above 100 ppm, which by today's classification is not a problem since it is not classified as acute toxic. According to the ECHA webpage it looks like it will most likely be classifed as acute toxic category 4. So to make it possible for the producer to use dispersions containing vinyl acetate there has been made an exemption for up to 1000 ppm of vinyl acetate in adhesives.

Change in the requirements decided by Nordic Ecolabelling's Criteria Group 17 March 2015:

In the previous version (version 1) of Chemical Building Products the requirement was as follows: maximum 100 ppm residual monomers classified as very toxic (Tx), toxic (T) or harmful to health (Xn). Probably the formulations "very toxic, toxic or harmful to health" are from version 1 and copied to version 2. They can not directly be compared with CLP. In version 2 it is moreover added "and classified as Acute Tox. Cat. 1-4" from CLP. That is, the classifications in the requirement are a mix of old classification and CLP.In version 2.2 of Chemical Building Products the requirements prohibits residual monomers harmful to healt, for example H332, Acute Tox. 4 (Xn, R20) and H302, Acute Tox. 4 (Xn, R22). This is not relevant compared to how we normally set the requirements or what the

Background argue. Within the "Harmful to health"- classification, the most relevant to prohibit regarding residual monomers is acute toxic, toxic, CMR and sensitising.Therefore The Nordic Ecolabelling Board decided 17 March 2015 to adjuste the requirement O7 to pinpoint which requirements regarding classifications are applicable for residual monomers. The clarification includes classification within Acute toxicity (except Acute tox 4: H332 (R20), H312 (R21), H302 (R22)), Specific target organ toxicity (except STOT RE 2), Sensitising and CMR.

The above mentioned adjustment, from version 2.2 to 2.3, turned out to make it strighter. That was not the intention. Therefore, Nordic Ecolabelling decided on 12 August 2015 to readjust the requirement, and at the same time to update the classification.

Nordic Ecolabelling decided in November 2016 in connection with the adjustment of O3 change even O7 so that acute tox was removed from the list of residual monomers in polymers that can not be present in 100 ppm. In March 2017 it was decided to clarify that the requirement to monomers applies only to polymers that are present in the product in over 1 %. These are usually, but not always, binders.

O7 Requirement text:

The total level of residual monomers in polymers present in the product >1 % may be no more than 100 ppm, where they are classified:

Classification according to CLP Regulation 1272/2008	
Hazard class and category	**H-phrase**
Carcinogenic Category Carc 1A/1B/2	H350, H351
Mutagenic Category Mut 1A/B/2	H340, H341
Toxic for reproduction Repr 1A/1B/2	H360, H361, H362
Specific target organ toxicity with single exposure STOT SE 1-2	H370, H371
Specific target organ toxicity with repeated exposure STOT RE 1-2	H372, H373
Respiratory sensitisation	H334

The quantity of residual monomers is to be stated for newly produced polymers. Exemption: Vinyl acetate can be in the polymer as rest monomer up to 1000 ppm.

The classifications is in accordance with the prevailing CLP Regulation EC (No) 1272/2008.

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

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 a way that the degradation of dead organic material and thus the release of nutrients are slowed[35].

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[36].

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[37].

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 (with the exception of barium sulphate, and other equally insoluble barium compounds), selenium and antimony – must therefore not be included in the product or in its constituent substances. It is, however, accepted that constituent substances may contain traces of the substances in the form of impurities. Trace amounts of each heavy metal must not exceed 100 ppm (0.1 mg/kg, 0.01% by weight) in the raw material. This means that the requirement is more strict than the general limit for impurities specified in section "1 General environmental requirement". It is relevant to set a stricter requirement to impurities 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 impurities.

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

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

A note about on based products and on DIN 53770-1 was included 12 August 2015.

O8 Requirement text:

The following heavy metals or heavy metal compounds must not be present in the product or in its constituent chemical substances:

- Cadmium
- Lead
- Chromium VI **
- Mercury
- Arsenic
- Barium (with the exception of barium sulphate, and other equally insoluble barium compounds)
- Selenium
- Antimony*

[35] SOU 2000:53
[36] SOU 2000:53
[37] Ahlstedt, 1999

Traces of the above mentioned metals, from impurities can be included up to 100 ppm (100 mg/kg, 0,01% by weight) per single metal in the raw material.

** An exception is made for antimony contained in a TiO_2 rutile lattice, on the following terms: test results (according to DIN 53770-1) must prove that the molecular structure is inert and that the environmental and health effects of the pigment are on the same level as, or better than, the results for C.I Pigment Brown 24 CAS no. 68186-90-3 and C.I Pigment Yellow 53 CAS no. 8007-18-9 in the report: UNEF Publications, OECD SIDS Initial Assessment Profile (www.inchem.org).*

*** For cement based products, please note the EU requirement to cement of max 2 ppm (2mg/kg) Cr(VI) (REACH Annex XVII no 47.1).*

☒ Duly completed declaration, see Appendices 1 and 2 from the manufacturer of the product and the manufacturer of each raw material.

☒ For pigment that contains antimony integrated into a TiO2 rutile lattice, documentation must be submitted to show that the molecular structure is inert and that the environmental and health effects of the pigment are on the same level as, or better than, the results for C.I Pigment Brown 24 CAS no. 68186-90-3 and C.I Pigment Yellow 53 CAS no. 8007-18-9 in the report: UNEF Publications, OECD SIDS Initial Assessment Profile (www.inchem.org).

O9 Titanium dioxide

Chemical building products containing more than 3.0% by weight titanium dioxide may cause significant pollution, since the production of titanium dioxide has a major green-house effect counted per kg TiO_2[38] and is particularly associated with emissions of sulphates, SO_2 and chloride. For this reason Nordic Ecolabelling has set requirements concerning emissions from the production of titanium dioxide.

Nordic Ecolabelling has chosen to focus on emissions, since it is important that the requirement has potential, relevance and steerability. In this context, it should be clarified that the requirement applies to the titanium dioxide process, and not the titanium dioxide pigment process.

The requirement level has been calculated based on the 38 g TiO_2/m^2 with 98% opacity on a standard reference surface (in the same way as for indoor paints) that has been used in the EU Ecolabel criteria for outdoor paints[39]. This has been done since Nordic Ecolabelling does not consider the functional unit m^2 to be relevant for outdoor paints and varnishes since the painted substrates varies so much and therefore effect the amount of paint needed, i.e. TiO^2/m^2 will not be a fair way of setting such a requirement.

O9 Requirement text:

If the product contains more than 3.0% by weight titanium dioxide, (CAS No: 13463-67-7):

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

2. In addition, emissions from the production of titanium dioxide shall not exceed the values given below during the sulphate process and the chloride process, respectively.

Sulphate process:

SOx expressed as SO_2: 7.0 kg/tonne TiO_2

Sulphate waste: 500 kg/tonne TiO_2

[38] IVL Report B 1338-A
[39] 2009/543/EC: Commission Decision of 13 August 2008 establishing the ecological criteria for the award of the Community eco-label to outdoor paints and varnishes.

Chloride process:

When using natural ore: 103 kg chloride waste/tonne TiO_2

When using synthetic ore: 179 kg chloride waste/tonne TiO_2

When using titanium ore: 329 kg chloride waste/tonne TiO_2

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

☒ Declaration, see Appendices 1 and 2, from the manufacturer of the product and the manufacturer of each raw material.

☒ If the product contains titanium dioxide, a description and calculation from the titanium dioxide producer is to be submitted, clearly showing that the requirement is fulfilled.

☒ Description of how powdered substances are handled during the production process.

O10 Constituent powdered substances

A requirement has been set that substances in powder form must be added in a closed system, in a suspension or by means of a method, e.g. protective equipment that ensures a "low-dust" working environment. The protective equipment/method should heavily 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 paint it binds to larger particles and is therefore no longer "respirable". To protect the people working in the production the requirement for constituent powdered substances is important for raw materials containing respirable silica, which is in powder.

O10 Requirement text:

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

☒ Description of how powdered substances are handled during the production process.

O11 Nanoparticles

There remains a great deal of uncertainty about how nanoparticles affect health and the environment[40]. Based on the precautionary principle, Nordic Ecolabelling wishes to adopt a restrictive stance on the use of nanoparticles in Nordic Ecolabelled products.

The nano definition in chemical building products is according to the European Commission's definition of nanoparticles[41]: "A nanomaterial is a natural, incidental or purposely manufactured material containing particles, in an unbound state or as an aggregate or as an agglomerate and where, for at least 50% of the particles in the number size distribution, one or more external dimensions is in the size range 1-100 nm."

[40] European Council, Recommendation 2017 (2013), Provisional version, Nanotechnology: balancing benefits and risks to public health and the environment. Available at the address: http://assembly.coe.int/ASP/Doc/XrefViewPDF.asp?FileID=19730&Language=EN (21.05.13)
[41] COMMISSION RECOMMENDATION of 18 October 2011 on the definition of nanomaterial (2011/696/EU)

A summary of the Nordic Ecolabelling's evaluation of nanomaterials in chemical building products is presented below. For more detailed information about specific nanoparticles the Nordic Ecolabelling can be contacted.

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 ingredients and it is difficult to keep an overview of all ingoing components and the size distributions of them. Many of the traditional ingredients 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 ingredients where a fraction of the nanoparticles are produced with even larger part of ultrafine particles than earlier and that the particles in many cases have a surface treatment.

In chemical building products it is possible to differentiate between traditional and new nanomaterials. The traditional nanomaterials are widely used in chemical building products and include carbon black (furnace black, lamp black) and amorphous silica (SiO_2). The new nanomaterials include nano-titanium dioxide, nano-zinc oxide, fullerenes and nanosilver[42]. The new nanomaterials are used to give the products new properties depending on particle size.

The particles are more often surface treated to avoid agglomeration when added to a product. This can be found in the report "Nanoteknologiske overflader og nye kvalifikationskrav" (nanotechnological surfaces and new quality requirements) from 2010, Danish Technological Institute[43] (Teknologisk Institut in Denmark). According to the report it is necessary to modify the surfaces of the nanoparticles to stabilize and disperse the particles in water, polymer or other solutions. The stabilization and the dispersing of the nanoparticles is reached by different chemical modifications (particle coatings) which ranges from hydrocarbon compounds, alkoxysilane compounds, phosphate compounds, sulphonate compounds and quaternary ammonium compounds.

Nanoparticle exposure in chemical building products
Various studies have been conducted on nanoparticles in building products and their effects.

Many different risk assessments on nanoparticles in paint, varnishes and sealants have been done, by for example NANOKEM and NanoHouse. "NANOKEM - Nanopartikler i farve- og lakindustrien. Eksponering og toksiske egenskaber" is a Danish project supported by the "Arbejdsmiljøforskningsfonden"[44]. The timeframe for the project was 2007-2011, but there have also been articles published within this project in 2013. The project is mainly focusing on release of nanoparticles and health aspects when sanding paints and varnishes. NanoHouse collaborative project is financed by the EU Comission through the framework program FP7 "Activities towards the development of appropriate solutions for the use, recycling and/or final treatment of nanotechnology-based products"[45]. The project started in January 2010 and is now finalized (January 2014). This

[42] 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
[43] H. V. Kristensen et al, Nanoteknologiske overflader og nye kvalifikationskrav, Teknologisk Institut, 2010
[44] Website for the project NanoKem: http://www.arbejdsmiljoforskning.dk/da/projekter/nanopartikler-i-farve-og-lakindustrien---nanokem (6/1-14)
[45] Website for the project NanoHouse: http://www-nanohouse.cea.fr/scripts/home/publigen/content/templates/show.asp?P=55&L=EN&ITEMID=2 (6/1-14)

project has studied release of particles from nanoparticles after both mechanic wear and wear from weathering exposure.

Both the Nanokem and the NanoHouse projects have shown that wear of paints do not result in release of nanoparticles, but that the nanoparticles are locked in the free paint particles.

Another study of 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)[46]. 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 photo-catalytic effect is reduced by ageing without being concluded with what the cause is.

A European Commission report from 2012 (see reference above) states that there is an ongoing debate on whether leaching from outdoor paints and/or the waste phase can lead to a significant quantity of nanoparticles.

Pigment
In this context, paint pigments are considered to be pigments produced as a more or less finely ground powder, where the powder particles comprise individual crystals up to aggregates of multiple crystals[47]. In paint it is generally more effective to use pigments with smaller particles than larger ones to achieve the same colour.

Inorganic pigments used in the paint industry that may occur in nano size include carbon black, iron oxides and titanium dioxide[48]. The carbon black used in paint is very finely ground and has a particle size of around 10-30 nm[49]. Iron oxide pigment may entirely comprise particles of nano size, or only a fraction of the particles may be nano.

A discussion with Kronos International[50], a producer of titanium dioxide (TiO_2), established that none of their regular grade TiO_2 counts as a nanomaterial under the EU's definition of nanomaterials (where at least 50% of the particles should be in nanosize to be considered a nanomaterial). According to Kronos, around 25% of the particles in their regular grades are less than 100 nm.

Nano-titanium dioxide is not considered a pigment, but a new nanomaterial that is added to give the products new properties, such as a self-cleaning effect in paints. These are not exempted from the requirement and therefore must not be used in Nordic Ecolabelled chemical building products.

There are many organic pigments that may comprise or contain fractions of nanoparticles. Examples of such pigments are: pigment yellow 1, 13 and 83, pigment orange 5 and 34 and pigment red 3[51].

[46] J. Olabarrieta et al, Aging of photocatalytic coatings under a water flow: Long run performance and TiO_2 nanoparticles release, Applied Catalysis B: Environmental, Volumes 123-124, 23 July 2012
[47] Coatings Handbook; Thomas Brock, Michael Groteklaes, Peter Mischke; 2000
[48] Industrial Organic Pigments; W. Herbst, K. Hunger; Third edition 2004; pp 120-124
[49] Coatings Handbook; Thomas Brock, Michael Groteklaes, Peter Mischke; 2000; p 128
[50] Email correspondence with the SHE Director at Kronos International, INC, 12.11.12
[51] W. Herbst, K. Hunger, Industrial Organic Pigments, Third edition 2004

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.

Amorphous silica (SiO_2)
As mentioned above, synthetic amorphous silica is considered a traditional ingredient in chemical building products. Since amorphous silica is a nanomaterial, under the European Commission definition, synthetic amorphous silica is exempted from the requirement concerning nanomaterials.

After the public consultation period the requirement was changed to make it possible for surface treated colloidal silica to be part of a chemical building product as long as it forms aggregates in the final product. There are requirements on the surface treatment; O3 (Classification of ingoing chemical substances) and O12 (Other excluded substances). What is meant by aggregates is described in the EU Commission's recommendation to nanodefinition (see reference above): "aggregate": a particle comprising of strongly bound or fused particles.

Consequences of the requirement
The requirement means that nanomaterials produced with the intention of containing nanoparticles must not be used. Examples of such nanoparticles are fullerenes, carbon nanotubes, nanosilver, nanogold and nanocopper. Traditional fillers on the other hand are permitted. Pigments are exempted from the requirement, such that TiO_2 may be used in pigment form.

During the public consultation period it was understood that it may be problematic to receive information regarding particle sizes for inorganic fillers from the raw material producers. 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[52].

In REACH directive (1907/2006/EF[53]) 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."

[52] Link to Miljøstyrelsens consultation: http://hoeringsportalen.dk/Hearing/Details/16910 (visited 20/1-14)
[53] Link to REACH-directive: http://eur-lex.europa.eu/LexUriServ/site/en/oj/2006/l_396/l_39620061230en00010849.pdf

After the public consultation period an exemption has been added for inorganic fillers as long as they are covered by appendix V, point 7 in REACH.

Polymer dispersions have also been exempted from the requirement after the public consultation period. In the follow up report from the EU Commission[54] to the second "Regulatory Review on Nanomaterials" from 2012[55] it is stated that the solid nano-materials dispersed in a liquid phase (colloidal) shall be considered as nanomaterials according to the EU Commissions recommendation. Nano emulsions are however not covered by the definition. Polymers/monomers can occur in different phases and sizes and it is therefore chosen to explicitly mention that polymers are exempted from the definition in chemical building products.

A data requirement has also been included regarding what nanomaterials that is included in the product. This is included to gain more knowledge about what types of nanoparticles that is in the products.

O11 Requirement text:

a) Nanoparticles (from nanomaterials*) are not permitted in the product.

The following are exempted from the requirement:

- Pigments**
- Naturally occurring inorganic fillers***
- Synthetic amorphous silica*** and precipitated calcium carbonate (PCC)
- Polymer dispersions

** The definition of nanomaterials follows the European Commission's definition from 18 October 2011 (2011/696/EU): "A nanomaterial is a natural, incidental or purposely manufactured material containing particles, in an unbound state or as an aggregate or as an agglomerate and where, for at least 50% of the particles in the number size distribution, one or more external dimensions is in the size range 1-100 nm."*

*** Nano-titanium dioxide (nano-TiO_2) is not considered a pigment and is therefore covered by this requirement.*

****This applies to fillers covered by appendix V point 7 in REACH.*

*****This applies to traditional synthetic amorphous silica. Chemically modified colloidal silica can be included in the products as long as the silica particles form aggregates in the final product. Surface-treated nanoparticles must fulfil requirement O3 (classification of constituent chemical substances) and requirement O12 (Other substances excluded from use).*

b) The producer must declare any nanomaterials present in the product.

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

O12 Other substances excluded from use

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

Substances of Very High Concern and the Candidate List

Substances of Very High Concern (SVHC): SVHCs are, as the name suggests, substances that require great caution due to their inherent properties.

[54] 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

[55] 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
Webpage for DaNa: http://nanopartikel.info/cms

They meet the criteria in Article 57 of the REACH Regulation: Substances that are CMR (category 1 and 2 under the Dangerous Substances Directive 67/548/EEC or category 1A and 1B under the CLP Regulation), PBT substances, vPvB substances (see section below) and substances that have endocrine disruptive properties or are environmentally harmful without meeting the criteria for PBT or vPvB. SVHCs may be included on the Candidate List with a view to them being inscribed on the Authorisation List, which means that the substance becomes regulated (ban, phasing out or other form of restriction). Since these substances face being phased out or banned, it is only logical for Nordic Ecolabelling not to permit this type of substance in ecolabelled products.

A substance may meet the criteria for SVHC without being included on the Candidate List, so there is no direct equivalence between SVHC and the Candidate List.

To avoid cross-references between PBT, vPvB, CMR and endocrine disruptors, instead of excluding SVHC (which does cover some CMR, PBT, vPvB, etc.) Nordic Ecolabelling chooses to exclude from use the substances on the Candidate List and to separately exclude PBT, vPvB and endocrine disruptors. This should still cover all SVHC substances.

"Persistent, bioaccumulative and toxic (PBT) organic substances" and **"Very persistent and very bioaccumulative (vPvB) organic substances"** are substances whose inherent properties are not desirable in Nordic Ecolabelled chemical building products. PBT and vPvB are defined in Annex XIII of REACH (Regulation (EC) No 1907/2006). Materials that meet or substances that form substances that meet the PBT or vPvB criteria can be found at: http://esis.jrc.ec.europa.eu/.

A list can also be found on: http://esis.jrc.ec.europa.eu/index.php?PGM=pbt.

Substances "deferred" or substances "under evaluation" are assumed not to have PBT or vPvB properties.

Potential endocrine disruptors are substances that may affect the hormone balance in humans and animals. Hormones control a number of vital processes in the body and are particularly important for development and growth in humans, animals and plants. Changes in the hormone balance can have unwanted effects and here there is an extra focus on hormones that affect sexual development and reproduction. Several studies have shown effects on animals that have been traced to changes in hormone balance. Emissions to the aquatic environment are one of the greatest sources for the spread of endocrine disruptors[56]. Nordic Ecolabelling bans the use of substances that are considered to be potential endocrine disruptors, category 1 (there is evidence of a change in endocrine activity in at least one animal species) or category 2 (there is evidence of biological activity related to changes in hormone balance), in line with the EU's original report on "Endocrine disruptors" or later studies[57], see http://ec.europa.eu/environment/endocrine/documents/final_report_2007.pdf.

[56] Miljøstatus i Norge, 2008:
[57] http://ec.europa.eu/environment/endocrine/documents/final_report_2007.pdf
http://ec.europa.eu/environment/endocrine/documents/bkh_report.pdf#page=1
http://ec.europa.eu/environment/endocrine/documents/wrc_report.pdf
http://ec.europa.eu/environment/docum/pdf/bkh_main.pdf

This entails a ban on substances such as bisphenol A, several phthalates and certain alkylphenols.

Organotin compounds: Chemical building products or raw materials in the products may contain organotin compounds. In addition,

Organotin compounds are used as a catalyst in sealants that harden through cross-linking. The level of tin catalyst depends on the cross-linking system, and the quantity of silicone or polymer. The quantity of tin catalyst is also tailored to the individual product. Add too much and the skin on the sealant develops too quickly, making it difficult for the user to ensure a fine, glossy finish before the product hardens. Add too little and the sealant will harden incorrectly, giving it poorer mechanical properties and a shorter functional lifespan. The sealant will be sticky on the surface and attract dirt. Organotin compounds are commonly found in silicone sealants.

Organotin compounds were on the Danish Environmental Protection Agency's list of undesirable substances[58], but were subsequently removed since they are used in quantities of less than 100 tonnes per year. They have a number of inherent properties that are not desirable in Nordic Ecolabelled chemical building products, such as endocrine disrupting and environmentally hazardous, see more below.

Tributyltin (TBT, CAS no. 688-73-3) is usually self-classified as H301, H312, H315, H319, H372, H400 and H410[59]. **Dibutyltin** (DBT, 1002-53-5) is usually self-classified as H302[60]. **Triphenyltin** (TPT, 668-34-8) is usually self-classified as H301, H311, H331,

H400 and H410[61]. Tributyltin (TBT) is the organotin compound that has been most thoroughly studied. TBT has been proven to have endocrine disruptive effects on marine organisms. Raised TBT concentrations have been recorded in various species of marine mammal, and research results show that the substance penetrates the blood-brain barrier and the hepatic barrier, and suppresses the immune system of mammals[62].

Plasticisers – Phthalates: Many phthalates have negative effects on health and the environment. Some phthalates are inscribed on the EU's priority list of substances that should be investigated more closely for endocrine disruption – and some have already been identified as endocrine disruptors. Phthalates have also received a great deal of coverage in the media, due to their properties. Phthalates are for several reasons not desirable in ecolabelled products. Some phthalates can be found on the Danish "Listen over Uønskede Stoffer" (List of undesirable substances). These are: Diethylhexyl phthalate (DEHP), dibutyl phthalate (DBP), butyl benzyl phthalate (BBP) and dimethoxyethyl phthalate (DMEP).

DEHP, DBP and BBP are also inscribed on the EU's priority list of substances that should be investigated more closely for endocrine disruption. Some phtalate compounds

[58] http://www2.mst.dk/udgiv/publikationer/2010/978-87-92617-15-6/pdf/978-87-92617-16-3.pdf
[59] ECHA: www.echa.eu (http://clp-inventory.echa.europa.eu/SummaryOfClassAndLabelling.aspx?SubstanceID=3635&HarmOnly=no?fc=true&lang=en, 24.06.2013)
[60] ECHA: http://clp-inventory.echa.europa.eu/DetailsOfNotifAndLabelling.aspx?SubstanceID=154766&NotificationID=10600814
[61] ECHA: http://clp-inventory.echa.europa.eu/SummaryOfClassAndLabelling.aspx?SubstanceID=228892&HarmOnly=no?fc=true&lang=en (24.06.2013)
[62] http://www.havet.nu/dokument/Havet2007-tbt.pdf (visited 14.01.2013)

are also listed on the candidatelist, these are: DEHP (bis-(2-ethylhexyl)phtalate), DBP (dibutylphtalate), BBP (benzylbutylphtalate), DIBP (diisobutylphtalate), DPP (dipentyl-phtalate), PiPP (pentaisophenylphtalate), DiPP (diisopentylphtalate), N-pentyl-isopentyl phatlate and bis(2-methoxyethyl)phtalate. All are on the list due to their classification a toxic for reproduction.

The limitation of the use of DEHP, DBP, BBP, DINP (diisononylphthalate), DIDP (diisodecylphthalate) and DNOP (di-n-octylphthalate) are also regulated by REACH Appendix XVII.

DIHP is in ECHA's register listed to be classified as CMR substances and can be added to the list of Substances for Very High Concern. DHP is listed in ECHA as an "intermediate" which can be classified as for example aquatic toxicity with H412. DHNUP can be found in a report from ECHA[63] where it is noted to have properties such as toxic to reproduction category 1B, 2 and 3 and therefore evaluated as a non-desirable phthalate in Nordic Ecolabelling.

In the EU Ecolabel criteria for indoor and outdoor paints (decision November 2013) a number of phthalates are excluded.

By precautionary reasons Nordic Ecolabelling choses to go on to exclude phthalates from the criteria as a group, since this group consists of a number of phthalates with different properties.

To ensure steerability for the requirement on phthalates, we are excluding phthalates from use in Nordic Ecolabelled chemical building products in this requirement.

APEO[64,65,66]: Alkylphenol ethoxylates and alkylphenol derivatives, i.e. substances that release alkylphenols on degradation, must not be used in ecolabelled chemical building products. APEO may occur in: binders, dispersants, thickeners, siccatives, anti-foaming agents, pigments, waxes, etc. APEO have a number of problematic environmental and health properties. They are not readily degradable according to standardised tests for ready degradability, they tend to bioaccumulate, they have been found in high concentrations in waste sludge, degradation products of APEO, alkylphenols and APEO with one or two ethoxy groups are very toxic to aquatic organisms and certain alkylphenols are suspected of being endocrine disruptors. Alkylphenols and bisphenol A are among the more potent chemicals with oestrogen effects that may occur in wastewater.

APEO-containing raw materials may be replaced with APEO-free raw materials that are based on three groups of surfactants: alkyl sulphates, alkyl ether sulphates and alcohol ethoxylates. These three groups of surfactants are readily degradable under aerobic and anaerobic conditions, and they are toxic or highly toxic to aquatic organisms.

Alkyl sulphates and alkyl ether sulphates are not considered to be bioaccumulative, but certain alcohol ethoxylates (in long chains with few ethoxylate units) have the potential to bioaccumulate. Even if the substituted surfactants are toxic or highly toxic to

[63] ECHAs rapport om DHNUP:
http://echa.europa.eu/documents/10162/13638/supdoc_dhnup_c7_11_20110526_en.pdf
[64] Substitution af alkylphenolethoxylater (APE) i maling, træbeskyttelse, lime og fugemasser, Working report from the Danish Environmental Protection Agency, No. 46/2003
[65] Nonylphenol og nonylphenolethoxylater i spildevand og slam, Miljøprojekt nr. 704/2002
[66] Feminisation of fish, Environmental Project no. 729, Danish Environmental Protection Agency, 2002

aquatic organisms, there is an environmental benefit to the substitution, since they are readily degradable. A further advantage of replacing APEO is that the degradation product nonylphenol is avoided. This product may be an endocrine disruptor.

Halogenated organic substances: Organic substances that contain halogenated substances such as chlorine, bromine, fluorine or iodine must not appear in Nordic 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, perfluoralkyl compounds and certain plasticisers are not permitted in Nordic Ecolabelled chemical building products.

Exemptions

There are also halogenated pigments used in the pain industry. There is an exception 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.

On April 19 2016, the Nordic Ecolabelling decided to make an exemption for polymerized vinylchloride in sealants and adhesives, in concentrations up to 2.0 weight%. The reason for that was to make it possible to ecolabel sealants and adhesives with higher flexibility and longer lifetime than other sealants. Polymerized vinylchlorides are long chained and do not have the same properties as the other excluded substances in this requirement, such as SVHC, PBT or endocrine disruptive effects.

This requirement was updated on June 1 2016 to include an exemption for driers used in oxidative drying paints, see also under requirement O3. These driers can contain halogenated organic substances and therefore need to be exempted.

Isocyanates: Isocyanates cause allergies and asthma and some, including TDI (toluene diisocyanate), are also carcinogenic. There are therefore special regulations governing work with material containing 0.5% isocyanates. Isocyanates are toxic to organisms in the environment.

Nordic Ecolabelling has chosen to exclude the use of isocyanates, based on their problematic properties, not least the following: "The harmfulness of isocyanates is reflected in the limit value set for their use. Most people are aware that organic solvents are harmful. However, if we compare the limit value for the solvent toluene with the limit

value for isocyanates, the latter is 100,000 times lower. Isocyanates are 100,000 times more dangerous than toluene"[67].

Nordic Ecolabelling has chosen to exclude water-borne polyisocyanates with a chain length of more than 10 since they are used in water-based paints, for example in binders.

These long-chain polyisocyanates are considered non-reactive since they are fully polymerised, which means fully reacted and stable. They are therefore unlikely to react and release isocyanates when used, for example when paint is applied. (Polymerisation: a reaction where two or more molecules bond and make a polymer. The polymer thereby comprises many identical units, with each unit called a monomer).

Fragrances: Fragrances must not be present in Nordic Ecolabelled chemical building products since fragrances do not have a function in the use of any 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 chemical building products.

Note that naphtha and bisphenol A have been deleted from this list, since their classification excludes them from use under requirement O3.

O12 Requirement text:

The product must not contain:

- Substances on the Candidate List*.
- Substances evaluated by EU as PBT (Persistent, bioaccumulable and toxic) or vPvB (very persistent and very bioaccumulable), in accordance with the criteria in appendix XIII in REACH.
- Substances considered to be potential endocrine disruptors in category 1 or 2 on the EU's priority list of substances that are to be investigated further for endocrine disruptive effects. See link: http://ec.europa.eu/environment/chemicals/endocrine/strategy/being_en.htm
- Organotin compounds
- Phthalates
- APEO – alkylphenol ethoxylates and alkylphenol derivatives (substances that release alkylphenols on degradation).
- Halogenated organic substances.
  Exemptions for
  - Preservatives that fulfil O5
  - Paint pigments that meet the EU's requirements concerning colourants in food packaging under Resolution AP (89) point 2.5
  - Polymers containing polymerized vinylchloride are permitted in adhesives and sealants, in concentrations under 2.0 weight% polymerized vinylchloride in the final product. Requirement O7 regarding rest mononomers needs to be fulfilled.

    Dries in oxidative drying paints, see also O3 regarding classifications.
- Isocyanates– Exemption for water-borne polyisocyanates with a chain length of more than 10, where the concentration of isocyanates with a chain length of less than 10 as an impurity is documented.

[67] http://www.leksikon.org/art.php?n=3600

- Fragrances

** The Candidate List can be found on the ECHA website at: http://echa.europa.eu/candidate-list-table*

Note the national legislations concerning PFOA in the Nordic countries. In Norway PFOA is regulated in «Forskrift om begrensning i bruk av helse- og miljøfarlige kjemikalier og andre produkter (produktforskriften)», §2- 32.

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

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

4.3 Volatile organic and aromatic compounds (VOC, VAH and TVOC)

This section relates to the requirements concerning adhesives, incl. multipurpose adhesives/construction adhesives (O13, O14), sealants (O16, O17), fillers (O19, O20), outdoor paints and varnishes (O22) and industrial paints and varnishes (O24), impregnating agents for tile, stone and concrete (O29) and anti-corrosion paint for industry and infrastructure (O31). All these requirements concern VOC, VAH and TVOC, and the background to these is therefore collected here.

4.3.1 Definition of VOC and VAH

Evaluation of a product's impact on the indoor environment depends on the type and quantity of gases and particles that are released (emissions, evaporation) into the air. Emissions are gases that are released from chemical building products, and others, and can be studied in special climate chambers. These can in turn be split into two groups, organic or inorganic, depending on the chemical composition. The group of volatile organic compounds (VOC) contains thousands of different chemicals. Examples of typical volatile organic compounds are isocyanates (hardeners), phthalates (plasticisers) and formaldehyde.

Volatile organic compounds (VOC) are defined here as follows:

Any organic compound having an initial boiling point less than or equal to 250°C measured at a standard pressure of 101.3 kPa (the same definition that appears in the VOC Directive 2004/42/EC).

These are measured according to the methods given in the VOC directive (2004/42/EG), i.e. as follows:

- Levels of volatile organic compounds are measured in g/l, according to the method ISO 11890-2 2002.
- Levels of volatile organic compounds where reactive diluents are present are measured in g/l, according to the method ASTMD 2369.

Volatile organic compounds 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[68].

Volatile aromatic hydrocarbons (VAH) are volatile organic compounds where one or more benzene rings are contained within the molecule, e.g. toluene, benzene and xylene. VAH are very stable. VAH are a subset of VOC.

4.3.2 Requirements concerning VAH and VOC

Volatile aromatic compounds (VAH) must not be actively added to any chemical building products, but may occur as a residue or impurity at a maximum of 100 ppm (0.01% by weight, 100 mg/kg). This applies to all volatile aromatic compounds, e.g. toluene.

Different requirement levels have been set for the maximum permitted quantity of VOC for each subgroup of chemical building products. This is because the various subgroups have different functions and thus a differing need for volatile organic compounds as a means of ensuring the function of the product. All requirement limits are based on product information that Nordic Ecolabelling has received via licensing and/or industry contacts.

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. When the product group was expanded with multipurpose adhesives/construction adhesives, it was estimated that the limit values for adhesives are suitable for multipurpose adhesives/construction adhesives as well. The ban on volatile organic compounds in wallpaper was also evaluated. According to the industry, the different wordings for wall paper glue and paste are now synonymous. It is therefore considered relevant to change the requirement so that all wallpaper adhesives are treated equally and in line with other product in the criteria document. Therefore, requirement O13 has been adjusted so that wallpaper adhesives should meet the same VOC limit as other glue, ie. 1%.

The requirement concerning sealants and fillers has been set such that they are permitted to contain a maximum of 3.0% by weight volatile organic compounds in each product.

The requirement for outdoor paints and varnishes has been set at a stricter level than the legal requirements defined in the VOC Directive 2004/42/EC, with a tightening compared with 2010 – see Table 4.3.2 below. In comparison with the EU Ecolabel's requirements, Nordic Ecolabelling's requirements are the same as or somewhat tougher than those proposed for the EU Ecolabel[69], see Table 4.3.2. The proposal in the EU Ecolabel's criteria is a tightening compared with the previous EU-version of the requirement. These new limits have been set based on data that Nordic Ecolabelling has gathered as part of the licensing process and during discussions with various manufacturers. Table 4.3.2 has been updated after the public consultation period so that the values for EU Ecolabel are the ones that were in the EU Ecolabel criteria document when they were decided in Brussels in November 2013. The categories in table 4.3.2 has been updated to be identical to the VOC-directive, the required limits are stricter than the directive.

[68] Miljoevejledninger.dk - http://www.miljoevejledninger.dk/index.aspx?articleid=+808+808
[69] EU Ecolabel draft criteria for indoor and outdoor paints and varnishes – June 2013

Table 4.3.2. VOC limits for outdoor paints and industrial paints in each subgroup

	Product classification, cf. 2004/42/EC	2004/42/EC limit values from 2010, stated in g/l	Limits in the EU Ecolabel criteria for indoor and outdoor paints (November 2013)	Maximum permitted quantity in Nordic Ecolabelled outdoor paints, stated in g/l
C	Exterior walls of mineral substrate	40	25	25
D	Interior/exterior trim and cladding paints for wood and metal including undercoats	130	80	75 (outdoor)
E	Interior/exterior trim varnishes and woodstains, including opaque woodstains	130	65 indoor 75 outdoor	65
F	Interior and exterior minimal build woodstains	130	50	50
G	Primers	30	15	10
H	Binding primers	30	15	10
I	One-pack performance coatings	140	80	80
J	Two-pack reactive performance coatings for specific end use such as floors	140	80	65

In the draft that was sent out to public consultation there was a requirement that VOC should be declared both as a calculation and a measurement/test report due to concerns that the calculations did not include all ingoing ingredients that contribute to the total VOC of the product. After the public consultation and discussions with stakeholders the requirement has been changed to only demand a calculation. The producers of chemical building products receive information from the raw material suppliers regarding the amounts of VOC in the raw materials. The amounts given are often the maximum amounts, i.e. the real level can be lower. When the calculations are done from the ingoing ingredients there are no losses from production included in the calculation, i.e. the concern of receiving lower values when calculating instead of measuring VOC was groundless.

The limit for the category "one-pack performance coatings" has been adjusted to 80g/l after the public consultation, since there were stakeholders saying that a limit on the same level as the EU Ecolabel was more reasonable since the products also need to fulfil quality requirement O23. Nordic Ecolabelling find the comments reasonable and the limit has therefore been changed (from 65g/l to 80g/l).

VOC for industrial paints is regulated through the VOC directive for industrial emission 2010/70/EU (annex 7). The limits are set at a temperature of 273.15K and a pressure of 101.3kPa, which are limits for emission and not limits in the same way as for exterior products.

The Nordic Ecolabel has set a new VOC limit for industrial paints after the public consultation period, which is 130g/l for all types of products. This limit only allows waterborne products to be labelled. 130g/l is also the highest allowed amount of VOC in consumer products according to the VOC-directive 2004/42/EG. This limit is a tough limit for industrial products since they can contain a lot more VOC than that. The reason for that is that the usage of industrial products is more controlled than it is for consumer products. The person applying industrial paints is also more protected than the painter of a consumer product. This level may in coming revisions be adjusted if Nordic Ecolabelling gather more information regarding industrial paints that indicate a need of change.

Industrial powder paints and varnishes are exempted from this requirement, since powder paints comprise powder-based raw materials with very low levels of VOC, a fact that Nordic Ecolabelling has confirmed in communication with various paint manufacturers.

As solvents can be avoided in tile and facade impregnating agents for tile, stone and concrete, the documented safety data sheets for this type of product should not show the use of volatile aromatic compounds (VAH) or volatile organic compounds (VOC). These substance groups are prohibited, but with the definition of constituent substances residues of contaminants allowed of maximum 100 ppm.

For anti-corrosion paint for industry and infrastructure, there is a steerability to minimize the emissions of VOC. In a report on life cycle analysis of rust protection on bridges[70], it is concluded that solvent-based anti-corrosion paints has the largest climate impact with regards to formation of ground-level ozone. Aromatic solvents are also a health risk for the worker. Since solvents can be avoided by shifting to water-based anti-corrosion paints, the documented safety data sheets for this type of product should not show the use of volatile aromatic compounds (VAH) or volatile organic compounds (VOC). These substance groups are prohibited, but with the definition of constituent substances residues of contaminants allowed of maximum 100 ppm.

4.3.3 Emission of total volatile organic compounds (TVOC)

Nordic Ecolabelling has also chosen to set requirements concerning the emission of total volatile organic compounds (TVOC). This requirement is not set for industrial paints and varnishes.

Emicode, M1, Blue Angel

The requirement means that the highest permissible quantity of emissions after 4 weeks, as TVOC, is 0.2 mg/m^{2}h converted into toluene equivalents. This limit means that the product fulfils the M1[71] indoor climate scheme.

Alternatively it is acceptable to test according to EMICODE EC1 (adhesives, sealants, fillers)[72] or Blue Angel[73], since the results are considered equivalent for these methods. This is based on a comparison conducted by Eurofins in 2010[74].

The EMICODE limits have been updated so that EMICODE now refers to test results after 28 days instead of the previous 10 days. EMICOD EC1+[75] is the toughest limit in the EMICODE tests, but EMICODE EC1 is the one most in line with the previous version of the Criteria for Chemical Building Products on the subject of TVOC, so Nordic Ecolabelling is retaining the limits in accordance with EMICODE EC1.

In this version of the criteria, the option of documenting TVOC for sealants using M1[76] has been removed, so as not to encourage applicant companies to use a test method that

[70] Life cycle analysis of anti-corrosion paints - bridges, Sweria IVF 2018
[71] Emission classification M1. Available at:
https://www.rakennustieto.fi/index/english/emissionclassificationofbuildingmaterials.html (visited 15.05.2012)
[72] http://www.emicode.de/
[73] http://www.blauer-engel.de/en/index.php
[74] Eurofins comparison: "Comparison Emicode EC1 Plus, Emicode EC1, Blue Angel RAL UZ 113, AgBB, CDPH Section 1350", 14 October 2010
[75] http://www.eco-institut.de/en/from-analysis-to-quality-assurance/national-marks-of-conformity/gev-emicodeR/
[76] Emission classification M1.
https://www.rakennustieto.fi/index/english/emissionclassificationofbuildingmaterials.html (visited 15.05.2012)

is generally considered poorly suited to the sealants that can be ecolabelled. This is because the application method used in the M1 standard makes it unreasonably difficult for aerobic sealants to meet the requirement limit.

TVOC limit values
When planning this revision, it was decided that the TVOC requirement for sealants in particular should be reviewed to establish whether the requirement limit was reasonable. This limit has been checked with the industry and has been judged to be at a good level. The requirement level has therefore not been adjusted. What has changed with regard to TVOC is that M1 has been removed from the test method options, as it is not considered relevant for sealants.

The requirement levels for fillers and adhesives also remain at the same levels as in version 1, since these are still judged to be reasonable. When the product group was expanded with multipurpose adhesives/construction adhesives, it was estimated that the limit values for adhesives are suitable for multipurpose adhesives/construction adhesives as well.

During the consultation, Nordic Ecolabelling will gather information concerning the need also to introduce a TVOC requirement for industrial paints and varnishes.

TVOC exemptions
Products sold in packs of 125 ml or less are exempted from the TVOC requirement. The reason for this is that users who buy a small pack are not expected to use up more than one pack in one go and that the exposure from such a small volume does not lead to large VOC effects. EMICODE exists as a test method for sealants and is more relevant for these products than M1.

SVOC, SemiVolatile Organic Compounds, have not been evaluated in this version of the criteria- SVOC has been included in the last version of the criteria for EU Ecolabel indoor and outdoor paints and may be evaluated in the next version of chemical building products. In the revision of indoor paint SVOC arose as a point of interest due to the risk of forming Black Magic Dust which in some cases can form on painted surfaces. There is a discussion of the reason for it and SVOC may be one reason.

Requirement text:

O13 Adhesives – Volatile organic compounds (VOC) and volatile aromatic hydrocarbons (VAH)

Volatile aromatic hydrocarbons (VAH) must not be actively added to the product, but may occur as residues or impurities to a maximum of 100 ppm (0.01% by weight, 100 mg/kg) in the final product.

Adhesives that are intended for frostproof use during the winter may contain maximum 6.0% by weight volatile organic compounds.

Other adhesives may contain a maximum of 1.0% by weight volatile organic compounds.

Note that if, during use, volatile organic compounds form, these must meet all applicable obligatory requirements.

Volatile organic compounds (VOC) are defined here as any organic compound having an initial boiling point less than or equal to 250°C measured at a standard pressure of 101.3 kPa. VOC content is measured according to the methods in the VOC Directive (2004/42/EC).

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

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

☒ Specification of the level of volatile aromatic hydrocarbons and calculation of VOC in the product (based on data for all ingoing ingredients).

O14 Adhesives – Emission of total volatile compounds (TVOC)

The total level of volatile organic compounds in adhesives must not exceed the following (depending on which test is used):

- M1: 0.2 mg/m²h converted into toluene equivalents after 4 weeks

  or
- EMICODE EC1: 100 µg/m³ after 28 days

  or
- Blaue Engel RAL UZ 113: 100 µg/m³ after 28 days

Note: If the product is intended for both outdoor and indoor use, it must meet the requirements concerning indoor adhesives.

Adhesives for indoor use sold in packs of less than 125 ml are exempted from this requirement.

☒ Specification of pack size.

☒ Test report in line with ISO EN 16000, parts 1, 3, 6, 9, 10, 11 for products sold in packs greater than 125 ml. The test laboratory must be accredited for the test method in line with standard EN ISO/IEC 17025 and that the laboratory fulfils the requirements in appendix 5.

O15 Adhesives – quality requirements

See quality requirements in Chapter 4.4.

O16 Sealants – Volatile organic compounds (VOC) and volatile aromatic hydrocarbons (VAH)

Volatile aromatic hydrocarbons (VAH) must not be actively added to the product, but are permitted as residues or impurities to a maximum of 100 ppm (0.01% by weight, 100 mg/kg) in the final product.

Sealants are permitted to contain no more than 3.0% by weight volatile organic compounds.

Note that if volatile organic compounds form during the use of the sealant, these must meet all applicable obligatory requirements.

Volatile organic compounds (VOC) are defined here as any organic compound having an initial boiling point less than or equal to 250°C measured at a standard pressure of 101.3 kPa. VOC content is measured according to the methods in the VOC Directive (2004/42/EC).

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

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

☒ Specification of the level of volatile aromatic hydrocarbons and calculation of VOC in the product based on data all ingoing ingredients.

O17 Sealants – Emission of total volatile compounds (TVOC)

The total level of volatile organic compounds in sealants must not exceed the following (depending on which test is used):

- EMICODE EC1: 100 µg/m³ after 28 days

  or

- Blaue Engel RAL-UZ 123: 300 μg/m³ after 28 days

If the product is intended for both outdoor and indoor use, it must meet the requirements concerning sealants for indoor use.

Sealants for indoor use sold in packs of less than 125 ml are exempted from this requirement.

✉ Specification of pack size.

✉ Test report in line with ISO EN 16000, parts 1, 3, 6, 9, 10, 11 for products sold in packs greater than 125 ml. The test laboratory must be accredited for the test method in line with standard EN ISO/IEC 17025 and that the laboratory fulfils the requirements in appendix 5.

O18 Sealants – quality requirements

See quality requirements in Chapter 4.4.

O19 Fillers – Volatile organic compounds (VOC) and volatile aromatic hydrocarbons (VAH)

Volatile aromatic hydrocarbons (VAH) must not be actively added to the product, but are permitted as residues or impurities to a maximum of 100 ppm (0.01% by weight, 100 mg/kg) in the final product.

Fillers are permitted to contain no more than 3.0% by weight volatile organic compounds in ready-mixed filler.

Note that if, during use, volatile organic compounds form, these must meet all applicable obligatory requirements.

Volatile organic compounds (VOC) are defined here as any organic compound having an initial boiling point less than or equal to 250°C measured at a standard pressure of 101.3 kPa. VOC content is measured according to the methods in the VOC Directive (2004/42/EC).

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

✉ Specification of the level of volatile aromatic hydrocarbons and calculation of VOC in the product based on all ingoing ingredient.

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

O20 Fillers – Emission of total volatile compounds (TVOC)

The total level of volatile organic compounds in fillers must not exceed the following (depending on which test is used):

- M1: 0.2 mg/m²h converted into toluene equivalents after 4 weeks

  or

- EMICODE EC1: 100 μg/m³ after 28 days

If the product is intended for both outdoor and indoor use, it must meet the requirements concerning fillers for indoor use.

Fillers for indoor use sold in packs of less than 125 ml are exempted from this requirement.

✉ Specification of pack size.

✉ Test report in line with ISO EN 16000, parts 1, 3, 6, 9, 10, 11 for products sold in packs greater than 125 ml. The test laboratory must be accredited for the test method in line with standard EN ISO/IEC 17025 and that the laboratory fulfils the requirements in appendix 5.

O21 Fillers – quality requirements

See quality requirements in Chapter 4.4.

O22 Outdoor paints and varnishes – Volatile organic compounds (VOC) and volatile aromatic hydrocarbons (VAH)

Volatile aromatic hydrocarbons (VAH) must not be actively added to the product, but are permitted as residues or impurities to a maximum of 100 ppm (0.01% by weight, 100 mg/kg) in the final product.

Outdoor paints and varnishes may contain the amount of volatile organic compounds stated in Table 6.

Note that if, during use, volatile organic compounds form, these must meet all applicable obligatory requirements.

Volatile organic compounds (VOC) are defined here as any organic compound having an initial boiling point less than or equal to 250°C measured at a standard pressure of 101.3 kPa. VOC content is measured according to the methods in the VOC Directive (2004/42/EC).

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

Table 6 VOC limits for outdoor paints and varnishes

	Product classification, cf. 2004/42/EC	Maximum permissible quantity of VOC stated in g/l (incl. water)
C	Exterior walls of mineral substrate	25
D	Interior/Exterior trim and cladding paints for wood and metal including undercoats	75
E	Interior/Exterior trim varnishes and woodstains, including opaque woodstains	65
F	Exterior minimal build woodstains	50
G	Primers	10
H	Binding primers	10
I	One-pack performance coatings	80
J	Two-pack reactive performance coatings for specific end use such as floors	65

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

✉ Specification of the level of volatile aromatic hydrocarbons and calculation of VOC in the product, based on all ingoing ingredients, showing that the relevant limit above is fulfilled.

O23 Outdoor paints and varnishes – quality requirements

See quality requirements in Chapter 4.4.

O24 Industrial paints and varnishes – Volatile organic compounds (VOC) and volatile aromatic hydrocarbons (VAH)

Volatile aromatic hydrocarbons (VAH) must not be actively added to the product, but are permitted as residues or impurities to a maximum of 100 ppm (0.01% by weight, 100 mg/kg) in the final product.

Note that if, during use, volatile organic compounds form, these must meet all applicable obligatory requirements.

Industrial paints and varnishes must not contain more than 130g/litre VOC.

Volatile organic compounds (VOC) are defined here as any organic compound having an initial boiling point less than or equal to 250°C measured at a standard pressure of 101.3 kPa. VOC content is measured according to the methods in the VOC Directive (2004/42/EC).

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

Industrial powder paints and varnishes are exempted from this requirement.

☒ Specification of the level of volatile aromatic hydrocarbons and calculation of VOC in the product (based on the data for all ingoing ingredients), showing that the product does not exceed the limit above.

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

O25 Quality requirements for industrial paints and varnishes for furniture

See quality requirements in Chapter 4.4.

O26 Quality requirements for industrial paints and varnishes for panels, floors and similar

See quality requirements in Chapter 4.4.

O27 Abrasion/wear for surfaces subject to heavy wear, e.g. floors and sheeting

See quality requirements in Chapter 4.4.

O28 Water resistance (floors)

See quality requirements in Chapter 4.4.

O29 Impregnating agents for tile, stone and concrete - Volatile organic compounds (VOC) and volatile aromatic hydrocarbons (VAH)

Volatile aromatic hydrocarbons (VAH) must not be actively added to the product.

Volatile organic compounds (VOC) are defined here as any organic compound having an initial boiling point less than or equal to 250°C measured at a standard pressure of 101.3 kPa. VOC content is measured according to the methods in the VOC Directive (2004/42/EC).

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

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

O30 Quality requirements for Impregnating agents for tile, stone and concrete

See quality requirements in Chapter 4.4.

O31 Anti-corrosion paint for industry and infrasturcute - Volatile organic compounds (VOC) and volatile aromatic hydrocarbons (VAH)

Volatile aromatic hydrocarbons (VAH) must not be actively added to the product.

Volatile organic compounds (VOC) are defined here as any organic compound having an initial boiling point less than or equal to 250°C measured at a standard pressure of 101.3 kPa. VOC content is measured according to the methods in the VOC Directive (2004/42/EC).

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

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

O32 Quality requirements for anti-corrosion paint for industry and infrastructure

See quality requirements in Chapter 4.4.

4.4 Quality requirements

This section describes the background to requirements O15 (adhesives), O18 (sealants), O21 (fillers), O23 (outdoor paints), O25–28 (industrial paints and varnishes) and O30 Impregnating agents for tile, stone and concrete.

Nordic Ecolabelling sets requirements on product quality, because the aim of the criteria development process is to draw up a criteria document for chemical building products that will allow the consumer – professional as well as DIY – to choose chemical building products that have the least negative impact on the environment and health and that are of a high quality.

Since 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, it is relevant to set requirements concerning performance and quality.

The text on what is required of a test laboratory has been moved to Appendix 6 to the criteria in order to gather all the information in one place.

An adjustment was done in O21, quality requirement for fillers, on December 20th 2017 to accept tests done with relevant measurements according to standard EN 16566 for fillers. This standard is not a harmonized standard but a national standard. For the fillers it is mainly relevant to measure adhesion. But if the filler to be tested is a product to be used in bathrooms or other areas where it is wet it is also relevant to measure wet scrub. Both these tests are included in the standard EN 16566.

In standard EN15824 there is also a adhesion test like in EN 16566, but the minimum requirement is higher in the second test; 0.5MPa. EN15824 has a requirement of adhesion at 0,3MPa which the producers find to be too low, especially on flat concrete. The filler is defined as follows in the standard:

Filler: coating material with a high proportion of extender, in powder or paste form, intended primarily to even out irregularities in substrates both internally and externally and/or to improve their surface appearance in order to prepare them to receive when required a paint or related system or bonded cover

Note 1 to entry: According to this definition, the product in question may be covered by wall paper or other decorative materials, or not over-coated, resulting in a textured coating left as it is or coloured in its bulk.

O15 Adhesives – Quality requirements

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.

Requirement text:

Adhesives are to be tested in accordance with the standards stated in the table below.

Table 5 Quality tests for adhesives

Types	Test method
Adhesives for wall and floor coverings	EN 1372, EN 1373, EN 1902 or equivalent methods. At least one comparable reference product is to be tested.
Ceramic tile adhesive	For dispersion adhesives: EN 1324 or equivalent methods. For cement-based adhesive: EN 1348 or equivalent. The adhesive must meet the minimum requirements in standard EN 12004 for the particular type of adhesive.
Wallpaper paste	Comparative test (see Appendix 4) that clearly shows the quality of the adhesive.
Wood adhesive	EN 205:2003 or equivalent methods. At least one comparable reference product is to be tested.
Multipurpose adhesives/construction adhesives	EAD 33 0449 00 0601 that has resulted in ETA approval
Other adhesives	Methods that apply for these products or comparative test (see Appendix 4) that clearly shows the quality of the adhesive.

✉ Test report from a laboratory in line with Appendix 5 or comparative test in line with Appendix 4, which clearly shows that the requirement is fulfilled.

O18 Sealants – quality requirements

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. These requirements also appear in this version of the criteria. Test for cement based products was added on 12 August 2015.

O18 Requirement text:

The sealant must, where appropriate, be tested in accordance with ISO 11600. Other sealants are to be subject to a comparative test (see Appendix 4) that clearly shows the quality of the sealant.

For cement based products within Sealants NS-EN 13888:2009 Grout for tiles, or equivalent methods, are accepted.

✉ Test report from a laboratory in line with Appendix 5 or comparative test in line with Appendix 4, which clearly shows that the requirement is fulfilled.

O21 Fillers – Quality requirements

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.

The requirement remains unchanged from version 1, except the test method for cement based products, which was added on 12 August 2015.

O21 Requirement text:

The manufacturer must describe how the filler is tested in order to ensure good, consistent quality, particularly in terms of viscosity, adhesion, gap-filling properties, shrinkage, minimal sinking and durability.

Test of fillers for plasterboard conducted in accordance with the standard EN 13963. Test of other fillers in accordance with EN 15824 or other relevant harmonised standards. For fillers tests of adhesion can also be approved according to EN 16566 and for products to be used in wet areas it is also required to do wet scrub measurements according to the standard.

Products can also be tested using a comparative test (see Appendix 4) that clearly shows the quality of the filler.

For cement based products within Fillers/Screed NS-EN 13813:2002+NA:2011 with relevant measurements according to table 1 chapter 5.2 in the standard, or equivalent methods, are accepted.

✉ Test report from a laboratory in line with Appendix 5 or comparative test in line with Appendix 4, which clearly shows that the requirement is fulfilled.

O23 Outdoor paints and varnishes – Quality requirements

The quality requirements for outdoor paints and varnishes are based on the requirements set out in the EU Ecolabel criteria for outdoor paints and varnishes[77]. There are, however, certain differences. This version of the criteria also contains an addition for powder paints for outdoor use.

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

Nordic Ecolabelling has been informed that the test for abrasion is only relevant for indoor floor products and the requirement from the EU Ecolabel criteria for outdoor paints and varnishes has therefore not been transferred to this version of the Nordic Ecolabelling criteria.

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

If the product is marketed as breathable (water vapour permeable), water repellent (low liquid water permeability), resistant to fungal growth or similar, this is to be documented via a performance test. The requirement in the EU Ecolabel criteria for outdoor paints and varnishes has been implemented with a few minor modifications. For example, there

[77] http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2009:181:0027:0038:EN:PDF (dated 13 August 2008)

is the addition that an "equivalent test" may be used, which allows the applicant to use a different test for this on condition that the test is equivalent to what is required in the criteria document and that the requirement level is fulfilled.

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

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

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

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

There is also a requirement that if, due to use of isothiazolinone compounds or IPBC, the product is classified as Xi R43 or "Contains (name of sensitising substance), may cause an allergic reaction", the product must also meet the relevant fungal growth test.

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

Table 4.4.1 Summary of test methods and assessment standards

1	**Weathering**	Masonry paints are to be tested according to	ISO 11507:2007
		Metal finishes are to be tested according to	ISO 11507:2007
		Wood paints, wood stains and wood varnishes are to be test according to	EN 927-6
2	**Results to be reported from weathering test:**	Flaking is assessed according to	ISO 4628-5:2003
		Cracking is assessed according to	ISO 4628-4:2003
		Blistering is assessed according to	ISO 4628-2:2003
		Colour change is assessed according to	ISO 7724-2
		Decrease in gloss is assessed according to	EN ISO 2813
		Chalking is assessed according to	EN ISO 4628-6:2007
		General appearance is assessed according to	EN ISO 4628-1:2003
3	**Water vapour permeability, Class II**	Masonry and concrete paints marketed as water vapour permeable are to be tested and assessed according to	EN ISO 7783-2:2011
4	**Liquid water permeability, Class III**	Masonry and concrete paints marketed as water repellent are to be tested and assessed according to	DIN EN 1062-3:2008
5	**Fungal growth; 1**	Products intended for mineral substrates are to be tested and assessed according to	BS 3900:G6
	Fungal growth; 2a	Products intended for wood are to be tested according to	EN-927-3
	Fungal growth; 2b	Products intended for wood are to be assessed according to	EN ISO 4628-1

6	**Powder paints**	Powder paints for outdoor use are to be tested according to Qualicoat or GSB	Qualicoat 13th edition GSB AL 631 GSB ST 663

Test for cement-based masonry paints was added 12 August 2015.

O23 Requirement text:

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

For all the following tests all test laboratories must fulfil the general requirements according to standard EN ISO/IEC 17025 or be an official GLP approved laboratory. Alternatively the companies own laboratory can work as a test laboratory if the laboratory is included by the company quality system, see appendix 5.

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

- Masonry paints shall be exposed to test conditions for 1000 hours (6 weeks) (UVA 4t/60ºC + humidity 4t/50ºC) according to ISO 11507: 2007.
- Metal finishes shall be exposed to test conditions for 500 hours (6 weeks) (UVA 4t/60ºC + humidity 4t/50ºC) according to ISO 11507: 2007.
- Wood paints, wood stains and wood varnishes shall be exposed to test conditions for 2000 hours (12 weeks) according to EN 927-6.

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

- Flaking (according to ISO 4628-5:2003). Product is to have a flake density of 2 or less, and a flake size of 2 or less.
- Cracking (according to ISO 4628-4:2003). The product is to have a crack quantity of 2 or less and a crack size of 3 or less.
- Blistering (according to ISO 4628-2:2003). The product is to have a blister quantity of 3 or less and a blister size of 3 or less.
- The colour change (according to ISO 7724-2) shall not exceed $\Delta E^*=4$ with respect to the initial value.
- Decrease in gloss (according to EN ISO 2813) shall not be greater than 30% of initial value – matte paints and varnishes with an initial gloss value less than 60% are exempted from the requirement.
- Chalking (according to EN ISO 4628-6:2007) for masonry paints and metal finishes. The product shall achieve at least 1.5 or more, i.e. 0.5 or 1.0. In the standard there are pictorial reference standards.
- General appearance (according to EN ISO 4628-1:2003).

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

✉ Test report from a laboratory in line with Appendix 5 which clearly shows that the requirement is fulfilled.

3. Water vapour permeability, Class II: If masonry and concrete paints are marketed as water vapour permeable or similar claims are made, the paints are to be classified as Class II, i.e. with average water vapour permeability or better according to test method

EN ISO 7783-2 and classified according to EN 1062-1 or EN 1504-2*. Due to large numbers of possible tinting colours, this criterion will be restricted to testing of the base paint. This method is not applicable for transparent primers.

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

✉ Test report from a laboratory in line with Appendix 5 which clearly shows that the requirement is fulfilled.

4. Liquid water permeability, Class III: If masonry and concrete paints are marketed as water repellent/hydrophobic or similar claims are made, the paints are to be classified as Class III, i.e. with low liquid water permeability according to DIN EN 1062-3: 2008. Due to large numbers of possible tinting colours, this criterion will be restricted to testing of the base paint.

✉ Test report from a laboratory in line with Appendix 5 which clearly shows that the requirement is fulfilled.

5. Fungal growth: If the product is classified with Xi R43 or "Contains (name of the sensitising substance), may cause an allergic reaction" because of the use of isothiazolinones or iodopropynyl butylcarbamate, IPBC, the product must pass the relevant fungal growth test, see below. If the product is marketed as "resistant to fungal growth" or similar, a test must be conducted that documents this.

Products intended for mineral substrates must achieve a score of 2 (under 10% fungal growth) or better, as established in BS 3900:G6 or equivalent.

Products intended for wood are to be tested according to EN-927-3 or equivalent. No detectable defects (class 0) and no defects visible under 10 times magnification (class 0) according to EN ISO 4628-1.

If an equivalent method is used, for example PREN 15457, the applicant must document that the test is equivalent to the tests specified in the criteria document.

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

✉ Test report from a laboratory in line with Appendix 5 which clearly shows that the requirement is fulfilled.

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

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

7. Cement-based masonry paints

The following alternative tests are accepted for cement-based masonry paints:

<u>Water vapour resistance:</u>
NS-EN ISO 12572:2001 "Hygrothermal performance of building materials and products - Determination of water vapour transmission properties", resistance against water vapour is measured.

<u>Driving rain:</u>
The method NBI-29/1983 "Mortars, resistance against driving rain", resistance against water penetration during driving rain is measured.

<u>Weathering:</u>
The method NBI-83 / 1983 with 28 days exposure time in climate carousel, equivalent to 1,5 years in real conditions. Colour change, bond strength and lime precipitation are measured as parameters for weathering resistance.

✉ Test report from a laboratory in line with Appendix 5 which clearly shows that the requirement is fulfilled.

Quality requirements for industrial paints and varnishes

Industrial paints and varnishes are applied to furniture, wall panels, floors and similar. The quality of these products is to be tested according to the methods that are relevant for the purpose of the paint/varnish.

O25 sets out quality requirements for paints and varnishes for furniture, and O26 covers products for wall panels, floors and similar. O27-O28 are requirements concerning surfaces subject to heavy wear such as floors. Industrial paints and varnishes for exterior use need to fulfil relevant parts of O23.

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

For all the tests specified below, the test laboratory must fulfil the general requirements in the standard EN ISO/IEC 17025 or be an officially GLP-approved laboratory. Alternatively the company's own laboratory can be accepted as the test laboratory, if the laboratory is included in the company's certified quality management system.

O25 Quality requirements for industrial paints and varnishes for furniture

Paints for use on furniture must meet the Möbelfakta criteria[78], which are the same as those in the criteria for furniture. As such the chemical building products and furniture are harmonised in this requirement.

The Möbelfakta criteria are a measure of how resistant the paint film is to scratches, heat, water, grease, coffee and alcohol. The requirement levels vary depending on the intended application for the paint. For example, a paint intended for worktops needs to meet higher standards than a paint for kitchen drawer bottoms.

O25 Requirement text:

Industrial paints and varnishes for furniture must fulfil the requirements as set out in the Tables 8 and 9 below.

Table 8 Requirement levels for varnished surfaces in different furniture groups.

Seating	Seat and armrest	Requirement level 2
Storage units	External horizontal surfaces (up to 1.25 m), shelves and bases	Requirement level 3
Tables	Private use and normal public use	Requirement level 4
	Intensive public use (restaurant/café)	Requirement level 5
Kitchen	Internal surfaces, including drawer bottoms, excluding shelves and bases	Requirement level 1
	External horizontal surfaces, shelves and bases	Requirement level 3
	Worktops (table tops)	Requirement level 6

[78] Möbelfakta http://www.mobelfakta.se/

Table 9 Test methods and requirement levels for furniture tests

Requirement category			Requirement levels					
Test:		**References:**	**1**	**2**	**3**	**4**	**5**	**6**
Water	1)	EN 12720	6h	16h	16h	24h	24h	24h
Grease	1)	EN 12720	24h	24h	24h	24h	24h	24h
Grease + scratches	1)	SS 83 91 22	-	-	-	24h+3N	24h+3N	24h+3N
Scratches	2)	SS 83 91 17	-	3N	3N	5N	5N	5N
Alcohol	1)	EN 12720	-	-	-	1h	1h	1h
Coffee	1)	EN 12720	-	1h	1h	1h	1h	1h
Heat, dryness	1)	EN 12722	-	-	-	70°C	70°C	-
Heat, dryness	1)	EN 12722	-	-	-	-	-	180°C
Heat, moisture	1)	EN 12721	-	-	-	-	-	85°C
Heat on edge	1)	NS 8061	-	-	-	-	-	85°C
Water on edge	1)	SS 83 91 20 NS8062 DS2175	-	-	1h	-	-	-
Sweat, acid and alkaline	1)	ISO 105E04	-	1h	-	-	-	-

1) = A result of 4 is a pass score in the assessment. Assessment after 24 h.
2) = Maximum scratch width 0.5 mm. Penetration of the varnish layer is not acceptable.
** = Applies to storage units – external horizontal surfaces ≤ 1,250 mm above floor-level.*
*** = Applies to armrests.*
**** = Applies to doors and drawer fronts.*

✉ Information on which function/end use the paints or varnishes have been tested for and which standard has been used, the test institute and a full test report clearly showing that the requirement is fulfilled.

O26 Quality requirements for industrial paints and varnishes for panels, floors and similar

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

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

Scratch resistance ASTM D2794 (http://www.astm.org/Standards/D2794.htm)

"Sheen Automatic Scratch Tester" according to ISO 1518 (1992)

O26 Requirement text:

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

- Scratch resistance ASTM D2794 (http://www.astm.org/Standards/D2794.htm)
- "Sheen Automatic Scratch Tester" according to ISO 1518 (1992)

✉ Complete test report showing that the paint/varnish has satisfactory scratch resistance for its intended purpose.

O27 Abrasion/wear for surfaces subject to heavy wear, e.g. floors and sheeting

Surfaces subject to heavy wear, e.g. floors, need to be painted/coated with paints or varnishes that are highly resistant to abrasion. One way of testing wear resistance of paints is by performing an abrasion resistance test according to EN ISO 7784-2:2006.

The requirement mirrors the requirement for the EU Ecolabel, i.e. to be approved a paint/varnish must have an abrasion resistance not exceeding 70 mg weight loss after 1000 test cycles with a 1000 g load and a CS10 wheel.

During the public consultation period comments on the test above were gathered. After communication with paint producers the requirement has been expanded with an alternative test method. That method is called ISO 5470-1 where a 1kg weight is the load in 1000 cycles with the H22 wheel and has a weight loss of maximum 3000mg.

O27 Requirement text:

Floor paints, floor coatings and other products subject to an equivalent level of wear must have an abrasion resistance not exceeding 70 mg weight loss after 1000 test cycles with a 1000 g load and a CS10 wheel according to EN ISO 7784-2:2006.

Alternatively a test according to ISO 5470-1 can be performed with 1000 test cycles with 1000 gram load and H22-wheel where the weight loss is maximum 3000 mg.

✉ The applicant must submit a test report showing that this requirement has been fulfilled in accordance with EN ISO 77842:2006 or ISO 5470-1.

O28 Water resistance (floors)

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

O28 Requirement text:

Varnishes, floor coatings and floor paints shall have a resistance to water, as determined by ISO 2812-3, such that after 24 hours' exposure and 16 hours' recovery no change of gloss or of colour occurs.

✉ Assessment and verification: The applicant shall provide a test report using the method ISO 2812-3 (Paints and varnishes – determination of resistance to liquids – Part 3: Method using an absorbent medium).

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 impregnanting 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.

O30 Requirement text:

A test must be carried out for wear according to EN 13892-4. The product must live up to the minimum AR 1 (i.e. AR 1 or lower numerical value for AR).

If the product is claimed to reduce coatings and fouling, a field test must be performed where tiles, stone or concrete with impregnation are applied according to the instructions for the product and visually compared with identical untreated tiles, stone or concrete. The test period must be appropriate so that the effect can be detected.

The applicant must show that the product is effective in relation to the claims of the product. The applicant must describe the test method, send photo documentation and describe how the results are evaluated.

For other claims, the applicant must perform tests that demonstrate compliance with the claims on the product. The applicant must state the test method, any data, how the results are evaluated and send photo documentation.

✉ Test report for EN 13892-4, which clearly shows that the requirement is met.

✉ For claims: Test report with the test method description, possible data, description of how results are evaluated and photo documentation.

O32 Quality requirements for anti-corrosion paint for industry and infrastructure

Testmethods and standards have been choosen in consultation with the industry but also with Research Institutes of Sweden (RISE), which is a state research institute and which among other thing, researches in sustainable anti-corrosion protection. Test methods for anti-corrosion can be specific of the purpose of the treatment because corrosion is a sustainabiliy question that affects areas such as public safety, durabilty and the economy. In general, anti-corrosion protection with a high quality and a long life span provides a surface treatment that can minimize both costs and environmental imprints from a life cycle perspective. Therefore, it is relevant to set a high quality requirement for products to be labeled with the Nordic Swan. It is also important to use products that contain the lowest possible levels of harmful substances that can contribute to the environmental impact. The quality test for anti-corrosion paints is divided into two parts, the first part is to ensure that the product does not contain heavy metals. In the second part of the quality requirement, it is ensured that the anti-corrosion paint maintains a sufficiently high quality for use for various purposes.

Requirement on heavy metal levels

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

Quality requirement

Test methods for anti-corrosion paints are specific to the purpose of the treatment. This is because environmental conditions and other external parameters can have a major impact on how aggressive the corrosion is. The most suitable requirements for anti-corrosion

paints are found in the international standard series EN ISO 12944 where test methods for anti-corrosion paints are specified in EN ISO 12944-6 and EN ISO 12944-9. To ensure that the anti-corrosion protection can withstand harsh conditions such as industrial areas with high humidity, aggressive atmosphere and coastal areas with high salinity, the minimum requirement is set to the highest classification, i.e. C5 according to EN ISO 12944-6. If the anti-corrosion protection contains zinc, the paint system must also pass the tests Im1-4, where the different classifications are matched by: Im1 (fresh water), Im2 (salt water), Im3 (in soil) and Im4 (synthetic sea water). These tests are relevant for zinc-rich colors even if the paints are to be used in atmospheric exposure. The tests are intended to phase out zinc-rich paints with highly active zinc. Too active zinc can cause unnecessarily high zinc leaching. If the anti-corrosion paint does not contain zinc, approved results according to Im1-4 are required only if the anti-corrosion protection is used for a protective steel exposed in soil or immersed in water. In regards with the above requirements, the anti-corrosion protection must also comply with the durability class Very High (VH). The durability class VH is defined as paints with a durability greater than 25 years, where the specified time is defined as the expected time until the first major maintenance needs to be done.

O32 Requirement text:

Anti-corrosion paints containing zinc:

Paint systems shall be tested according to the methods relevant to the purpose of the treatment, i.e. C5 or alternatively CX.

- Metallic zinc included in the product must be of Type II or higher grade according to ASTM D520.
- The paints must meet the requirements for corrosion class C5 (Very High) according to EN-ISO 12944-6 and test for immersion category: Im 1 (fresh water), Im 2 (salt water) and Im 3 (soil) according to EN ISO 12944-6, and test EN ISO 2812-2 (synthetic seawater) made with scratched samples according to EN-ISO 12944-9.
- If the intended use of the paints is offshore or equivalent, the paints must meet the requirement for corrosion class CX (Offshore). If cathodic protection is to be used, the paints must meet the requirement of Im 4 according to EN ISO 12944-9.

Anti-corrosion paints without zinc:

Paint systems shall be tested according to the methods relevant to the purpose of the treatment, i.e. C5 or alternatively CX.

- The paints must meet the requirements for corrosion class C5 (Very High) according to EN-ISO 12944-6.
- If the paint is to be used immersed in water or in soil, it must also pass tests according to Im1 (fresh water), Im2 (salt water) and Im3 (in soil) according to EN-ISO 12944-6, as well as testing EN ISO 2812-2 for immersion category Im 4 (synthetic sea water) according to EN ISO 12944-9.
- If the intended use of the paint is offshore or equivalent, the paints must meet the requirement for corrosion class CX (Offshore). If cathodic protection is to be used, the paints must meet the requirement of Im 4 according to EN ISO 12944-9.

✉ Test report for metallic zinc according ASTM D520.

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

4.5 Requirements concerning packaging, labelling, consumer information and recycling

O33 Packaging

The requirement has been set that packaging must be re-sealable in order to ensure that the products can be used on multiple occasions, unless documentation can be submitted that the product will always be used all at once.

Moreover, the type of plastics used must be documented by the manufacturer to ensure that neither the labels nor the product packaging contain halogenated plastics. This is because the incineration of PVC and other halogenated plastics can give rise to problems during disposal.

Packaging may sometimes (in our experience) be treated with a surface coating that contains halogens such as fluorine in order to prevent the product from sticking to the packaging and not releasing. Nordic Ecolabelling therefore also sets the requirement that the surface coating on the packaging must not contain halogens.

Metal packaging is heavy to transport. However, because some products may require metal packaging, the requirement is set that metal packaging must not be used for packs of less than 1 l unless particular health and environment-related arguments indicate otherwise. Products that will be pigmented/made up to a given colour such that their end volume is 1 l are considered to fulfil the requirement for metal packaging. In November 2016 this requirement was updated to allow the metalpackaging even for packing <1 liter. Although metals have worse environmental profile than plastic, it has advantages in paint cans: It is difficult to find good enough plastic packaging especially for the smaller packaging sizes that do not leak or do not have problems with skinning which to some extent may depend on the fack that plastic itself is not completely sealed, but there is a certain exchange through the plastic. This becomes more significant for smaller jars when the plastic surface becomes relatively greater compared to the volume.

O29 Requirement text:

Packaging must be resealable, unless documentation can be provided that the entire product will always be used in one go.

The type of plastic material must be documented by the manufacturer. Labels and product packaging must not contain halogenated plastic.

Packaging and any surface coating must not contain halogens.

✉ Packaging sample or photo of the packaging showing that the packaging can be resealed.

✉ Description of the packaging type and size.

✉ Descriptions of whether the entire product is always used in one go.

✉ Declaration from the packaging manufacturer that no halogenated plastics have been used or product data sheets clearly showing that the requirement is met by all parts of the packaging, including lids, caps, etc.

✉ Declaration from the packaging manufacturer that the packaging has not been surface coated, or that the surface coating does not contain halogens.

✉ Declaration from the label producer that no halogenated plastics have been used.

O34 Label/product packaging

In order to ensure that the Nordic Ecolabel logo is applied correctly, a sample of the label/print on the packaging must be submitted with the application – a PDF file is acceptable for this.

O30 Requirement text:

The label/product packaging must carry the Nordic Ecolabel logo, licence number and product group or relevant category (e.g. filler or adhesive) designation.

✉ Label/product packaging – a PDF file is acceptable for this.

O35 Consumer information

Consumer information requirements have been set in order to ensure that the product is used correctly 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, how to clean tools and how to handle residues in order to minimise the risk of incorrect handling is required to inform the user.

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.

The packaging for sealants is to carry a recommendation that the sealant is smoothed/ finished using a smoother/sponge or cloth, and not a finger, for example. The point of this is to avoid unnecessary skin contact with the product.

O31 Requirement text:

The following information must be placed on the packaging or enclosed with each individual product:

- The purpose, substrate and other conditions of application for which the product is intended. This shall include advice on preparation and so on, e.g. correct preparation of the substrate, outdoor use (if relevant) or temperature.
- Estimate of "normal" coverage (e.g. l/m^2, g/m or equivalent).
- Recommended preventive safety measures for users, such as safety equipment and ventilation (particularly when working in enclosed spaces or similar, or when using industrial paints).
- Recommendations on cleaning used tools and how waste products from cleaning can best be disposed of (to limit water pollution). These recommendations are to be adapted to the product types and areas of application. Pictograms may also be used where appropriate.
- Sealants: A recommendation that the sealant should be finished using a smoother/sponge/cloth or similar is to be included in the product description and it is not to be recommended that this is done with a thumb/finger.
- Recommendations on how the product is to be stored after opening, including safety instructions where relevant.

- Recommendations on the disposal of residual product and packaging.

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

O36 Take-back system

The Nordic Ecolabelling's Criteria Group decided on the 9 October 2017 to remove this requirement.

O37 Sorting and handling of waste

The manufacturer must have a plan for the sorting and handling of waste. The quantity of hazardous waste is to be reported. This requirement previously existed in the criteria for adhesives, but is a new requirement for chemical building products. Nordic Ecolabelling wishes to support more optimal waste sorting and handling as a means of reducing the amount of unsorted waste in society.

O33 Requirement text:

The manufacturer of the chemical building product must have a plan for the sorting and handling of waste.

The quantity of hazardous waste is to be reported.

✉ Report on how waste is handled and sorted, including a sorting plan.

✉ Report on the quality of hazardous production waste.

4.6 Quality management, regulatory requirements and marketing

Nordic Ecolabelling sets these general requirements concerning quality management to ensure that the products always fulfil the set ecolabelling requirements. If the manufacturer has an environmental management system that is certified under ISO 14 001 or EMAS and the following procedures are applied, it is sufficient if the accredited auditor certifies compliance with the requirements.

O38 Laws and regulations

The requirement ensures that the holder of the Nordic Ecolabel licence takes responsibility for safety, the working environment and environmental legislation, as well as enforcing compliance with terms and conditions/conventions at the production facilities during the production of the ecolabelled products.

O34 Requirement text:

The licensee shall ensure compliance with all applicable local laws and provisions at all production facilities for the Nordic Ecolabelled product, e.g. with regard to safety, working environment, environmental legislation and site specific requirements/concessions.

✉ Declaration from the licensee (signed application form) that the requirement is fulfilled, plus a report to the regulatory authority.

O39 Licence administrators

A clear description must be submitted (in the form of an organisational chart, for example) to show who is responsible for ensuring that the Nordic Ecolabelling criteria are

fulfilled and who the Nordic Ecolabelling contact is, in order to ensure that Nordic Ecolabelling is informed of any changes or problems.

O35 Requirement text:

The company shall appoint an individual responsible for ensuring the fulfilment of Nordic Ecolabel requirements, and a contact person for communications with Nordic Ecolabelling.

✉ Organisational chart showing who is responsible for the above.

O40 Documentation

The licence applicant must save a copy of the submitted documentation in order to be able to refer back to it at a later date, and so that it is available to personnel during the period of validity of the licence. On an inspection visit, the documentation must be available to Nordic Ecolabelling.

O36 Requirement text:

The licensee must be able to present a copy of the application and factual and calculation data supporting the documents submitted with the application (including test reports, documents from suppliers and suchlike).

🔑 On-site inspection.

O41 Product quality

To ensure that the ecolabelled products maintain an even quality routines on dealing with complaints and claims are necessary.

O37 Requirement text:

The licensee must guarantee that the quality of the Nordic Ecolabelled product is maintained throughout the validity period of the licence.

✉ Procedures for collating and, where necessary, dealing with claims and complaints regarding the quality of the Nordic Ecolabelled product.

O42 Planned changes

A Nordic Ecolabelled building product is ecolabelled on the understanding that the formulation is exactly as approved by Nordic Ecolabelling. Any changes must therefore be reviewed and assessed by Nordic Ecolabelling before they are incorporated into the production. The licensee must have procedures in place to ensure that Nordic Ecolabelling is informed of any planned changes that have a bearing on the requirements.

O38 Requirement text:

Written notice of planned product and marketing changes that affect the Nordic Ecolabelling requirements must be given to Nordic Ecolabelling.

✉ Procedures detailing how planned product and marketing changes are dealt with.

O43 Unforeseen non-conformities

Unforeseen non-conformities that affect the Nordic Ecolabelled product must be reported to Nordic Ecolabelling, and procedures for this must be in place at the factory to ensure that non-conformities are dealt with and that Nordic Ecolabelling is informed about them.

O39 Requirement text:

Unforeseen non-conformities that affect Nordic Ecolabelling requirements must be reported to Nordic Ecolabelling in writing and logged.

✉ Procedures detailing how unforeseen non-conformities are handled.

O44 Traceability

Procedures for traceability of the Nordic Ecolabelled product are important in ensuring that, in the event of a complaint, the factory can trace back from the end product to the ingredients that went into it. In the case of problems in production, a traceability system can help ensure that all ingredients in the Nordic Ecolabelled product are the same and in the same quantities as at the time of application.

O40 Requirement text:

The licensee must have a traceability system for the production of the Nordic Ecolabelled product.

✉ Description of/procedures for fulfilment of the requirement.

O45 Marketing

The Board of Directors decided on 17 November 2014 to remove O41 Marketing from the criteria document.

5 Changes compared to previous version

The key changes compared with version 1 are listed in Table 5.1 below.

Table 5.1 Summary of key changes compared with version 1

Req. (no. in version 2)	Version 1	Version 2	Comments
Product group definition	Adhesives Sealants Fillers Outdoor paints and varnishes	Adhesives Sealants Fillers Outdoor paints and varnishes Industrial paints and varnishes	Expansion to include industrial paints and varnishes
O2 Classification of the product	Classification according to Dangerous Preparations Directive and reference to an appendix for translation to CLP.	Classification according to Dangerous Preparations Directive and CLP in the requirement.	
O3 Classification of constituent chemical substances	Classification in accordance with Dangerous Preparations Directive and reference to an appendix for translation to CLP.	Classification according to Dangerous Preparations Directive and CLP in the requirement. The documentation requirement has been expanded to require SDS for all raw materials. Exemptions: Preservatives that are used to preserve the product are exempted from the requirement of classification as acute toxic 1-4 and specific target organ toxicity with repeated exposure (further requirements concerning preservatives are stated in O5). Formaldehyde as an impurity in newly produced polymers, see separate requirement O6. Freshly produced sealants may contain methanol to a maximum level of 0.10%. Respirable crystalline silica/quartz is exempted from the classification as STOT RE 1 with H372. Respirable crystalline silica can be up to 1% in the raw material, see requirement O10 regarding constituent powder substances. Bisphenol A up to 5ppm in epoxy paints are exempted.	Classifications according to CLP have been included in the requirement. The list with exemptions has been adjusted and expanded.
O4 Environmentally harmful substances	Was a part of requirement 3 with a complex formula	Simplified formula taken from classification rules according to CLP.	

O5 Preservatives	Isothiazolinones < 15 ppm in sealants Outdoor paints < 2000 ppm isothiazolinones	Isothiazolinones < 100 ppm in sealants Outdoor paints < 1500 ppm isothiazolinones New categories for industrial paints	The limit for sealants and adhesives is now the same. The limit for outdoor paints has been tightened. New limit values for industrial paints have been added.
O11 Nanoparticles	Nanometals, nanocarbon carbons and/or nanofluorine compounds must not be actively added to chemical building products, unless it is documented that they will not cause environmental and health problems. *Nanoparticles are defined here as microscopic particles, where at least one of the dimensions is less than 100 nm. Nanometals include nanosilver, nanogold and nanocopper.*	Nanoparticles (from nanomaterials*) are not permitted in the product. The following are exempted from the requirement: Pigments** Naturally occurring inorganic fillers*** Synthetic amorphous silica*** Polymer dispersions ** The definition of nanomaterials follows the European Commission's definition from 18 October 2011 (2011/696/EU): "A nano-material is a natural, incidental or purposely manufactured material containing particles, in an unbound state or as an aggregate or as an agglomerate and where, for at least 50% of the particles in the number size distribution, one or more external dimensions is in the size range 1-100 nm."* *** Nano-titaniumdioxide (nano-TiO_2) is not considered a pigment and is therefore covered by this requirement.* ****this applies to fillers covered by appendix V point 7 in REACH.* *****This applies to traditional synthetic amorphous silica. Chemically modified colloidal silica can be included in the products as long as the silica particles form aggregates in the final product. The surface treatment of surface-treated nanoparticles must fulfil requirement O3 (classification of constituent chemical substances) and requirement O12 (Other substances excluded from use).*	A new nano requirement has been introduced and the nano definition has been amended.
O12 Excluded substances	Persistent, bioaccumulating and toxic (PBT) organic compounds l Very persistent and very bioaccumulating (vPvB) organic compounds	Substances on the Candidate List*. Substances evaluated by EU as PBT (Persistent, bioaccumulable and toxic) or vPvB (very persistent and very bioaccumulable), in accordance with the criteria in appendix XIII in REACH.	The requirement text regarding vPvB och PBt has been adjusted.
O17 TVOC sealants	EMICODE EC1: 300 µg/m^3 after 10 days	EMICODE EC1: 100 µg/m^3 after 28 days	

O20 TVOC fillers	EMICODE EC1 GEV testing protocol (newest available version): 200 µg/m^3 after 10 days	EMICODE EC1: 100 µg/m^3 after 28 days	
O22 VOC outdoor paints		Tightening of all limit values in the table.	
O23 Quality requirements (exterior paint)		Updating of standards	The recommended standards have been updated.
O24-O28 Industrial paints **New req.**	Industrial paints were not included in the criteria.	New requirements for industrial paints (VOC and quality).	
O29 Packaging		Packaging and any surface coating must not contain halogens.	Addition to the requirement that halogens must not be contained in surface coatings.
O31 Consumer information		New text: Estimation of "normal" coverage. Recommended safety measures have been extended to include industrial paints. Addition that a smoother/ sponge or cloth should be used to apply sealant instead of a finger.	Two points have been added to the consumer information since version 1.6.
O32 Take-back system		The recovery of packaging is a key stage in the ecocycle of materials. Some Nordic countries have well developed take-back systems for used packaging, which Nordic Ecolabelling wishes to support in order to ensure greater recycling of packaging. Relevant national regulations, legislation and agreements within the sector regarding take-back systems for products and packaging shall be complied with in all the Nordic countries where the Nordic Ecolabelled products are marketed. The relevant take-back systems in the Nordic countries are: PYR in Finland Grønt punkt in Norway FTiAB (previously REPA) in Sweden	There has previously been a voluntary industry agreement on packaging operations in Norway, which has led Nordic Ecolabelling to have a requirement to ensure that licensees for a number of (45) product groups comply with this regulation. Requirements for return systems have now been incorporated into the Norwegian Waste Regulations, which means that the Nordic Ecolabelling requirement for membership in a return company will be out of date and therefore no longer need to be managed by Nordic Ecolabelling in a separate requirement. The Nordic Ecolabelling's Criteria Group decided on the 9 October 2017 to remove this requirement.
O33 Sorting and handling of waste **New req.**		The manufacturer must have a plan for the sorting and handling of waste. The quantity of hazardous waste is to be reported.	A new requirement that previously appeared in the criteria for adhesives.

O41 Marketing	Marketing of Nordic Ecolabelled chemical building products must comply with the "Regulations for the Nordic Ecolabelling of Products" dated 22 June 2011 or later versions. ☒ Duly completed Appendix 4.	Marketing of Nordic Ecolabelled chemical building products must comply with the "Regulations for the Nordic Ecolabelling of Products" dated 22 June 2011 or later versions. Chemical building products with a Nordic Ecolabel license within the category "industrial paints and lacquers" must not be marketed to the consumer market. ☒ Duly completed Appendix 4. ☒ Marketing materials, labels and a signed declaration from the producer of industrial paints and lacquers that the products will not be marketed toward the consumer market.	The requirement has been supplemented with a text regarding industrial paints and lacquers that may not be marketed towards consumers. The Board of Directors decided on 17 November 2014 to remove O41 Marketing from the criteria document
Appendices	Appendix 1 Manufacturer's declaration Appendix 2 Raw material declaration Appendix 3 Marketing declaration Appendix 4 Converting classifications	Appendix 1 Manufacturer's declaration Appendix 2 Raw material declaration Appendix 3 Formulation structure Appendix 4 Marketing declaration Appendix 5 Comparative tests Appendix 6 Test laboratories for quality tests	The raw material and manufacturer declarations have been amended to follow the requirements in version 2. A new appendix concerning the formulation has been added. Conversion between classifications is now contained in each requirement, and Appendix 4 from version 1 has been deleted. Appendix 5 has been added to show what is required in a comparative test. Appendix 6 sums up what is required of a test laboratory that conducts quality tests. This text previously appeared under each requirement.

6 New criteria

- Review the opportunity to expand the product group to include "Industrial adhesives".
- Review potential environmental gains by requirements to SVOC (Semi Volatile Organic Compounds) in paints and varnishes (exterior and industrial).
- Review the requirements for industrial paints and varnishes to see what other environmental gains that can be made.
- Review the possibility of further limit the amounts of isothiazolinones.

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Terms and definitions

Term	Explanation or definition
CLP	Classification, Labelling and Packaging of substances and mixtures – EU Regulation
CMIT/MIT	CMIT/MIT is a blend of 5-chloro-2-methyl-2H-isothiazol-3-one and 2-methyl-2H-isothiazol-3-one in a ratio of 3:1. The blend is used as a preservative.
IPBC	Iodopropynyl butylcarbamate, used as a preservative in products such as paints.
Isothiazolinones	Used as a preservative in products such as paints and sealants. This group includes MIT and BIT.
SVHC	Substances of Very High Concern
TVOC	Total VOC
VAH	Volatile Aromatic Hydrocarbons, which are a subset of VOC.
VOC	Volatile Organic Compounds

Appendix 1 Other labels

Ecolabelling type 1

There are a number of type 1 ecolabels in Europe and around the world that have criteria for outdoor paints, varnishes, etc. Those that are considered relevant in the Nordic countries are:

- EU Ecolabel (the EU's own ecolabel) which has criteria for: Outdoor Paints and Vanishes[79].
- Blue Angel (Germany) which has criteria for: Low-pollutant Paints and Varnishes[80].

EU Ecolabel Criteria for Outdoor Paints: The EU Ecolabel published its Criteria for Outdoor Paints[81] shortly after the release of the Nordic Ecolabelling Criteria for Chemical Building Products. The EU Ecolabel Criteria for Outdoor Paints largely sets requirements for the same things as the Nordic Ecolabelling Criteria for Chemical Building Products. There are, however, a few minor differences in the requirement levels – in some cases Nordic Ecolabelling has tougher requirements and in other cases the EU Ecolabel has tougher requirements. Nordic Ecolabelling has several requirements concerning the exclusion of substances and groups of substances (which may cause licence applicants to see the Nordic Ecolabel as having the toughest requirements). However, the EU Ecolabel has tougher requirement limits for preservatives and environmentally harmful substances. The EU Ecolabel requires more tests than the Nordic Ecolabel, but the Nordic Ecolabel requires testing over a much longer period than the EU Ecolabel.

A revision of the EU Ecolabel Criteria for Outdoor Paints is underway in 2012/2013. The most interesting proposed changes that have so far come out of the revision work are a tightening of the VOC limit value, see Table B1:1, and an amendment to the requirement concerning isothiazolinones.

Table A1:1, Proposed VOC limit values for paint categories C-J in line with Directive 2004/42/EC, showing current and proposed new requirement levels from the EU Ecolabel's revision work (May 2013)

Description	EU Ecolabel (g/l)	Proposed (May 2013) new levels (g/l) (EU)
C) Exterior walls of mineral substrate	40	25
D) Interior/exterior trim and cladding paints for wood and metal	90	80
E) Interior/exterior trim varnishes and wood stains, including opaque wood stains	90 outdoor	65 outdoor
F) Interior and exterior minimal build wood stains	75	75
G) Primers	15	12
H) Binding primers	15	12
I) One-pack performance coatings	100	80
J) Two-pack reactive performance coatings for specific end use such as floors	100	80

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[80] Blaue Engel, Germany. Available at: http://www.blauer-engel.de/ (visited 26.04.2012)
[81] 2009/544/EC: Commission Decision establishing the ecological criteria for indoor paints and varnishes.

Nordic Ecolabelling will continue to monitor the EU's revision of the criteria for outdoor paints.

Asthma and Allergy Associations

In Sweden[82], Norway[83], Denmark[84] and Finland[85] the respective Asthma and Allergy Associations offer a label for products that meet their criteria, with a focus on asthma and allergies. When it comes to paints, their criteria focus on emissions (e.g. after 14 days, but it may vary from country to country). The Nordic market currently has some painted/varnished building materials (e.g. flooring, wall and ceiling panels and cladding) that have been labelled. The exception, however, is that the Danish Asthma and Allergy Association does not label products with which the user has no skin contact.

Environmental product declarations (EPDs)

Environmental product declarations (EPDs) give detailed environmental information without setting specific requirements for the products. The benefit of the declarations depends entirely on the purchaser's knowledge of the environmental conditions surrounding the product they are buying. There is no international system for environmental product declarations as yet, but work on this is underway. In order to create an environmental product declaration, relevant product category rules (PCR) must first be drawn up/agreed. Although EPDs are quite common within the construction industry generally, a search for EPDs on the website where all issued EPDs are listed (www.environdec.com) shows that EPDs are not as common for chemical building products[86].

ECOproduct

ECOproduct is a method and a database created in Norway to facilitate the choice of environmentally friendly materials and products on a building project, based on information from environmental product declarations. ECOproduct is a Norwegian collaboration between SINTEF Byggforsk, NAL, ECOBOX and Byggtjeneste, with support from Statsbygg, NCC, Byggemiljø, Husbanken, the Norwegian Defence Estates Agency, the National Office of Building Technology and Administration and others. ECOproduct is based on the product's environmental profile, or similar information, and assesses the quality of the product in terms of indoor air quality, content of substances harmful to health and the environment, resource consumption and impact on the greenhouse effect. The product is awarded a grade (red, white or green) for each of the following areas: indoor air quality, substances harmful to health and the environment, greenhouse effect and resource consumption[87].

Green Public Procurement (GPP)

Green Public Procurement (GPP) is a voluntary instrument used to clarify and verify environmental criteria for public procurement of products and services.

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[82] Astma och Allergi Förbundet (Sweden), www.astmaoallergiforbundet.se (visited 05.12.2012)
[83] Norges Astma- og Allergiforbund (Norway), www.naaf.no (visited 05.12.2012)
[84] Astma-Allergi Forbundet (Denmark), www.astma-allergi.dk (visited 05.12.2012)
[85] Allergia-ja Astmaliitto (Finland), www.allergia.fi (visited 05.12.2012)
[86] The International EPD® System, Available at: http://www.environdec.com/en/Site-search/?query=plaster (visited 25.05.2012)
[87] http://www.byggtjeneste.no/WPpages/Produkter/Byggeportalen/ECOproduct.aspx?folder=WPpages/Produkter/Byggeportalen/ECOproduct.aspx (visited 26.06.2012)

EU: Has none at the moment, but is in the process of developing GPP requirements for the product group Outdoor paints[88].

Swedish Environmental Management Council: refers to the industry labels BASTA, Byggvarubedömningen and to SundaHus assessed products[89].

DIFI in Norway: Has construction criteria that include chemical requirements[90].

Danish Environmental Protection Agency: Has criteria for procurement of paints[91].

Requirements have also been drawn up for chemical building products in conjunction with the development of GBP requirements for houses.

Among public procurement officers there is great interest in various kinds of certification showing environmental and health properties of the products (e.g. low emissions, M1 classification) and these certifications clearly influence the purchasing decision. The Nordic Ecolabel has requirements for M1 or an equivalent level of emission measurement for the subgroups Fillers, Adhesives and Sealants, and therefore should be at least as good as anything else in public procurement processes.

Environmental management

ISO 14001[92] is common among the major companies that produce chemical building products. However, it is not something they use to market their products.

Industry labels

There are several databases to turn to, including Byggvarubedömningen which makes environmental assessments of building products and classifies them as Recommended, Acceptable or Avoid[93]. SundaHus also makes environmental assessments of building products, and classifies them with coloured arrows in the classes Black, Red, Orange, Yellow and White[94].

BASTA is the Swedish construction industry's own initiative to help phase out harmful chemical substances in the construction sector. They have a database of registered products that, according to the companies, meet BASTAS's criteria[95]. "Norges Byggevarebase" NOBB[96] and "CoBuilders informationsdatabase[97]" are Norwegian electronic databases of all types of construction-related products, where the ecolabelled products are highlighted with the Nordic Ecolabel or EU Ecolabel symbol/logo.

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88 EU's Green Public Procurement, Available at: http://ec.europa.eu/environment/gpp/index_en.htm (visited 24.05.2012)
89 Swedish Environmental Management Council, Information om upphandlingskriterier i Sverige. Available at: http://www.msr.se/ (visited 24.05.2012)
90 Agency for Public Management and eGovernment (DIFI). Informasjon om offentlige anskaffelser. Available at: http://www.anskaffelser.no/tema/2009/06/miljokriterier (visited 24/05/2012)
91 Danish Environmental Protection Agency, Informasjon om bæredygtige indkøb i Danmark. Available at: http://www.mst.dk/Virksomhed_og_myndighed/Gron_strategi/baeredygtige_indkoeb/ (visited 24.05.2012)
92 Environmental management systems - Requirements with guidance for use. ISO 14001 (2004)
93 Byggvarubedömningen. Available at: http://www.byggvarubedomningen.se/sa/node.asp?node=455 (visited 26.04.2012)
94 SundaHus. Available at: http://www.sundahus.se/home.aspx (visited 26.04.2012)
95 BASTA. Available at: http://www.bastaonline.se/ (visited 26.04.2012)
96 NOBB. Available at: http://www.byggtjeneste.no/WPpages/Produkter/NOBB/Default.aspx?folder=WPpages/Produkter/NOBB (visited 27.04.2012)
97 CoBuilders informationsdatabase. Available at: http://www.cobuilder.com/Tjenester/ (visited 27.04.2012)

Denmark has developed systems equivalent to BASTA, with a product database available at "www.dansk-kemidatabase.dk", managed by ALECTIA[98].

Others

The systems for ecolabelling houses/buildings BREEAM[99] and LEED[100] and the German Sustainable Building Council (DGNB)/World Green Buildings Council (WGBC)[101] also include building materials in their assessments. Compliance with the health and environment parameters that are required for approval in BREEAM and LEED can now be documented in Norway by presenting a Nordic Ecolabel licence, as long as the Nordic Ecolabelling requirements include the requirements specified in BREEAM and LEED.

These systems can be excellent partners where the national branches decide to reward Nordic Ecolabelled products.

M1

Finland has an emission classification for building materials called M1[102], which we refer to in the criteria requirements O14 and O20. M1 testing is conducted 28 days after the product has been installed. M1 sets requirements concerning emission levels of total volatile organic compounds (TVOC), formaldehyde (HCOH), ammonia (NH3), carcinogenic substances in category 1 of IARC 1987, and any odour/smell.

M1 is administered by Rakennustieto (The Building Information Foundation), a private foundation with representatives from 49 Finnish building organisations.

Some companies see M1 as a direct competitor of the Nordic Ecolabel and consider an M1 label sufficient to prove a product's environmental credentials. However other companies see them as entirely different entities and consider the Nordic Ecolabel as some sort of complement and final proof of the matter. M1 has become a recognised label that can be used in all the Nordic countries, although it is primarily used in Finland.

[98] http://www.dansk-kemidatabase.dk/?q=front (visited 26.06.2012)
[99] BREEAM. Available at: http://www.breeam.org/ (visited 27.04.12)
[100] LEED. Available at: http://leed.se/ (visited 24.07.2012)
[101] DGNB. Available at: http://www.dgnb-international.com/international/#poi11 (visited 04.07.2012)
[102] Emission classification M1. Available at:
https://www.rakennustieto.fi/index/english/emissionclassificationofbuildingmaterials.html (visited 15.05.2012)

Appendix 2 RPS, MECO table and requirement distribution

An assessment of Relevance, Potential and Steerability (RPS) for the environmental impact of the different life cycle phases is presented here divided into the subgroups Materials, Energy, Chemicals and Other (MECO).

Function and Functional unit:
Chemical building products mainly have the primary and secondary function of:

Primary: Treating a surface so that it has the required properties (e.g. adhesion, smoothness, water repellency, attractiveness…)

Secondary: They must function/remain effective for many years (maybe 10-30 years depending on the subgroup).

The secondary function has a considerable effect on the environmental impact of the products in that an increased useful life (with an inherent increase in quality) results in a lower environmental impact. This is due to the savings gained from not having to extract new raw materials and produce new products, and the effect relates to the entire life cycle.

It is difficult to specify a meaningful functional unit, since these products are designed to be applied to substrates with very different properties, e.g. wood, concrete, brick, stone, blocks, plasterboard or coarse wall surfaces.

It is therefore neither meaningful nor appropriate to use x litres product/m^2 area as a functional unit. The functional unit should instead be content/litre, without water. However, with regard to emissions and quality, the functional unit m^2 area can and should be used.

MECO and RPS
R, P or S written in bold indicates a positive outcome, and R, P or S written with no bold indicates a negative outcome, in terms of whether we can influence that area by means of ecolabelling criteria. In order to establish functional requirements, the assessment of all three parameters (R, P and S) must be positive, as indicated by a bold **R P S**. If one or more of them have a negative outcome in the assessment, e.g. **R** P S, R **P** S or R **P S**, ecolabelling criteria will not have the desired effect.

Table B2. MECO with RPS assessment and reference to the Nordic Ecolabelling requirements in version 1 of the criteria.

	Material	Production	Usage phase	Waste	Transport
Materials	Machinery for mining/extracting raw materials. **R** P S	Factories equipped to manufacture relevant chemical building products	Hand tools, e.g. brushes, rollers, filling knives, sealant guns.	Used brushes, rollers, filling knives. Protective gloves.	Crude oil
		R P S	**R** P S	**R P** S	**R P** S
	Factories equipped to refine and synthesise relevant raw materials.	Storage tanks, pipes, mixing tanks, weighing scales, conveyors, packaging machines.	Mechanical tools, e.g. filler bazooka, paint/filler spray.	Packaging	Electricity mix
	R P S	**R** P S	R P S	**R P** S	**R P** S
	Extraction, refining and synthesising of petrochemical materials.			Chemical residues	
	R P S			**R P** S	
	Planting, harvesting and refining plant raw material.			Material recovery	
	R P S			**R P** S	
	Mining/extraction of minerals (Zn, Fe, Ti, Chalk, Sand, Clay...) R P S				
	TiO_2 various production methods.				
	R P S or **R** P S				
Energy	Energy for closed/open-cast mining.	Energy consumption and CO_2 emissions during the process. Judged to be relatively low, as mainly relates to mixing raw materials and then packaging.	Electricity for lighting to during application	Packaging recycling	Transport of raw materials + end product by sea, rail and road.
	R P S	R P S	**R** P S	R P S	**R P** S
	Energy for extraction/cultivation, refining and synthesising of raw materials and packaging.		Possibly electricity for dryers.	Incineration/disposal of construction waste	
	R P S		**R** P S	**R** P S	
	Energy for burning of limestone		Electricity for paint/filler spray.		
	R P S		**R** P S		
	Energy for production of polymers				
	R P S/**R P** S				
	Energy for extraction of oil/vegetable oils.				
	R P S/**R** P S				

Chemicals and emissions	Sulphate or chloride emissions from TiO_2 manufacture. **R P S** or **R** P S Any emissions and discharges from extraction and manu-facturing processes. **R P** S	Classification T, Xn, C, Xi/Xn and N for constituent raw materials. **R P S** Nanoparticles **R P S** Emissions and dis-charges from the production of the chemical building products. **R P S** Purity of the raw materials and exposure risk. **R P S** Cleaning water (in pipes and tanks) is often recycled in the next blending batch as the water component in the formulation. (Steered by open/ closed process) **R P S** / R P S	Classification: T, Xn, C, Xi/Xn and N for products. **R P S** Emissions: VOC, allergens and emissions from "new" reactive products (e.g. formaldehyde and methanol). **R P S** Purity of the raw materials and exposure risk. **R P S**	Substances from the chemical building products may end up in terrestrial, limnic and marine ecosystems. **R P** S Emissions from incineration of demolition material that includes the chemical building products. **R P** S Recovered products end up, for example, as filler. **R P** S Good environmental and health properties plus purity of raw materials and exposure risk. **R P S**	NOx and SOx **R P** S
Other	Working environment **R P** S Effect of mining on ecosystems. **R P** S Effect of open-cast mining, oil drilling and plantations on ecosystems. **R P** S	Working environment **R P S**	VOC and allergen emissions during hardening/drying. **R P S** indoors Working environment for professional products. **R P S** Product quality/life time on substrate. **R P S**	Material recovery or reuse R P S	Eco Driving, logistics **R P S** or **R** P S