About Nordic Ecolabelled

Small houses, apartment buildings and buildings for schools and pre-schools



Version 3.13

Background to ecolabelling
23 March 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:

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1 Summary

During 2014–2015 the criteria for small houses, apartment buildings and pre-school buildings have been revised. As from this revision, school buildings can also be Ecolabelled. Homes for the elderly and for persons with physical or mental functional impairment may also be Nordic Swan Ecolabelled for as long as the residential facilities are classed as housing and not as care facilities/premises. Temporary modules/pavilions that are set up as homes, pre-schools or schools are also included in the product group definition.

Nordic Swan Ecolabelled buildings are assessed on the basis of a lifecycle perspective and

- have low energy consumption
- fulfil strict environmental and health requirements on construction products, materials and chemical products
- ensures a good indoor environment and low emissions
- have a quality-assured construction process

The revised criteria version 3, have a good balance between the requirement areas, so that the Nordic Ecolabelling scheme continues to be seen as a holistic label for building structures. The revision has taken pains to ensure that the requirements do not collide with opportunities to label model houses/concepts, and that Nordic Ecolabelling is independent of location (concerns the obligatory requirements). The revision has changed several of the requirements related to national laws, regulations and norms, in order to facilitate the roll-out of the same concept in several countries. There are still national requirements such as the energy requirement, daylight requirement and the point requirement for better noise environment.

The number of obligatory points is reduced from 51 to 41. In some cases, this is a result of how similar requirements have been merged, while requirements that have outplayed their role, or are assessed to be of limited environmental benefit, have been removed completely. Requirements that have been removed are individual measurement of heating energy, as well as the obligatory requirements of low-flush toilets, illumination intensity, handling of chemical products and waste handling during the construction process.

The number of point-score requirements has been increased from 8 to 14 since one sub-objective of the revision was to increase the opportunities to score points. Several completely new point-score requirements have been added and the point-score requirements are gathered in a separate section at the end of the criteria.

The most important changes as a consequence of the revision are presented below.

Energy and other resources

The purpose of the energy requirement is that Nordic Swan Ecolabelled houses, pre-schools and schools achieve good energy performance in the use phase. As the countries' energy regulations for new production are tightened in order to gradually achieve the level for near-zero-energy buildings, the Nordic Ecolabelling requirements present a challenge that must be addressed by the revision. The more energy efficient a building is, the smaller the ratio of energy used for heating. This means that the scope for using technical measures to further improve the building's energy performance is decreasing.

The requirement in criteria version 3 is still made in relation to each country's energy requirements in its building regulations, but the percentage rates are differentiated. This achieves greater flexibility and better adjustment. If/when a country changes its energy requirement levels, the others do not also have to change theirs. The scope for greater improvement in one country can be used even if equivalent potential is not found in another Nordic country. To also apply household energy, the requirement is supplemented with stricter requirements of white goods, and demand-controlled lighting.

The requirement of individual measurement of heating energy has been removed as reports show that individual measurement of heating is not cost-effective. The requirement of individual measurement of domestic hot water has been changed from an obligatory requirement to a point-score requirement. The requirement of impermeability testing now solely includes routines to perform impermeability testing as an element of quality management, as well as routines for corrective measures if the measured value deviates from the projected value.

As the energy requirements in the building regulations are tightened, the scope to be even more energy efficient is narrowing. The relevance and potential of a point-score requirement is thus more limited than in version 2 of the criteria and the point-score requirement has been removed.

The point-score requirement for energy contributions from local renewable energy sources is still in place and gives points according to the proportion of the energy requirement that is covered. A whole new point-score requirement has been introduced that rewards the use of cement and concrete products with a reduced energy and climate impact. In addition, a new point-score requirement is introduced to reward the use of renewable raw materials (wood) in construction elements such as carcasses, trusses and maintenance-free façades. The background to these requirements is the new knowledge that energy use in materials production is a large element of the building's energy use, viewed from a lifecycle perspective.

Indoor environment

One sub-objective of the revision has been to strengthen the link between a good indoor environment and good health. All indoor-environment related requirements are gathered in one section, to increase clarity. The revision has had focus on formulating a requirement that gives good daylight in the building but can also be reasonably achieved and interacts with all of the functions and benefits building is to provide.

The point-score requirement for noise levels from small houses and apartment buildings from version 2 is still a point-score requirement, but limits and the number of points rewarded are changed. The ventilation requirement has been changed to include function inspection of the ventilation system in conjunction with occupation.

Materials and chemicals

The requirements of chemical products and construction products and materials have been revised to remove ambiguities and duplications. The requirement of lists of materials has been expanded to include a logbook for the property. When ecolabelled construction products are used, this gives a higher number of points than before as Nordic Ecolabelling wishes to stimulate the use of Nordic or EU Ecolabelled construction products, as these products fulfil strict environmental requirements.

The new timber requirements have been added to the criteria version 3, where certain prohibited tree species are listed. Wood to larger construction parts like roof trusses, frames and joists, interior panels and exterior façades must be certified. Nordic Ecolabelling hopes that this will make both the requirement and verification process both simpler and clearer.

2 Basic facts about the criteria

2.1 Justification for Nordic Ecolabelling

Small houses, apartment buildings and buildings for pre-schools and schools may be Nordic Swan Ecolabelled. Homes for the elderly and for the functionally impaired are also included in this definition, as well as temporary modules/pavilions used as homes, pre-schools or schools.

Nordic Ecolabelling makes requirement of the building's energy use, chemical products, construction products/goods and a number of indoor environmental aspects that are relevant to the health and the environment. Nordic Ecolabelling also makes requirements of quality management in the construction process, and the handover of the building to the residents and administration/operations.

Nordic Swan Ecolabelled buildings are assessed on the basis of a lifecycle perspective and

- have low energy consumption
- fulfil strict environmental and health requirements on construction products, materials and chemical products
- ensures a good indoor environment and low emissions
- have a quality-assured construction process

2.2 Summary of relevance, potential and steerability

In conjunction with Nordic Ecolabelling's assessment of the criteria in 2013, a MECO analysis was performed[1]. A MECO analysis describes the environmental aspects of Materials, Energy, Chemicals and Other aspects, based on a building's entire life cycle from use of raw materials to production, operation and disposal/destruction. With the MECO analysis as the starting point, an RPS analysis has been performed to describe Relevance, Steerability and Potential for the various environmental and indoor environmental aspects of a building. Relevance is assessed on the basis of which environmental problems the product group causes and how extensive those problems are. Potential is assessed in terms of potential environmental benefits within the product group and steerability is a measurement of how the environmental aspects can be influenced by ecolabelling.

Nordic Ecolabelling uses the RPS analysis in order to ensure that requirements are made of the aspects that give the greatest environmental benefits in terms of the product's

[1] The separate MECA analysis for buildings is written in Scandinavian languages and can be ordered via the Nordic Ecolabel: sara.bergman@svanen.se

entire life cycle. The RPS analysis is summarised in this section and the full text can be found in appendix 4[2].

In a life cycle perspective, the following areas are significant in terms of the environmental and health aspects of a building:

- Energy use and climate impacts
- Use of materials and construction products
- Chemical products and hazardous items in construction supplies and materials
- Indoor environment
- Building quality and lifetime of the building.

Energy and climate impacts

The analyses Nordic Ecolabelling has taken part in show that the operations phase is still relevant in terms of buildings' total energy consumption, viewed in a life cycle perspective. There is considerable diversification in new production in terms of energy consumption per square metre, making this an area with major potential. Steerability is limited to the building's calculated energy consumption and differences can be found in relation to the actual measured consumption, but an energy calculation is still assessed to be sufficient to verify the energy performance.

On the other hand, previous assumptions that the climate impact from a building's energy consumption during operation significantly exceeds the climate impact of constructing the building have proved to not always be correct. A recent research study has shown that the climate impact from constructing the building is on the same scale as the climate impact from the building's energy consumption during a calculated lifetime of 50 years[3]. The absolutely largest share (84%) originates from construction elements and construction products. Transport accounts for a very small proportion (3%) and the processes at the construction site account for the remaining 13%. The report concludes that the conclusions are representative of energy-efficient apartment buildings with concrete carcases. The construction elements that contribute most to the upstream climate impacts (i.e. product phase and construction phase) are concrete, concrete products, use and reinforcement, i.e. the actual carcase.

Chemical products and construction products

Environmentally hazardous and harmful chemicals occur in a large number of construction supplies and chemical products[4]. Stringent requirements of hazardous substances in chemical products and supplies are assessed to distinguish the Nordic Swan Ecolabel within the industry and are still very relevant, helping to eliminate or reduce emissions to the immediate environment. For many (not all) construction supplies there are environmentally adapted alternatives in which the content of hazardous substances has been restricted or completely phased out. The industry is continuing to phase out hazardous substances and environmentally adapted alternatives are coming into the market. There is thus also considerable potential.

[2] Appendices 2-12 are not translated into English but are available as appendices to the Background Document written in Scandinavian.
[3] The building's climate-impacted life cycle calculation of the climate impact and energy consumption for a newly constructed energy-efficient apartment building of concrete, Liljenström et al. 2015 (final report in SBUF project no. 12912). The report can be downloaded at www.sverigesbyggindustrier.se/publikationer
[4] Hälsoskadliga kemiska ämnen i byggprodukter- förslag till nationella regler. Kemikalieinspektionen Rapport 8/15. Sverige 2015.

Steerability for Nordic Ecolabelling is also assessed to be good, provided that the materials requirements are drawn up on a clear and reasonable basis.

In general, steerability is low for parameters far back in the supply chain, unless there is good traceability in the specific supply chain, as for example applies to certified sustainably grown wood/timber. Nordic Ecolabelling makes requirement of certified sustainably grown wood and the requirement contributes to increased demand for wood products from certified areas.

Indoor environment

A building is not primarily constructed to be energy-efficient, but for the people who live or work there to do well and thrive. Potential and steerability are good for several important indoor environmental factors, such as noise, daylight, moisture and radon. For more information see chapter 5.5 in this Background document. Nordic Ecolabelling has the declared ambition to strengthen the link between a Nordic Swan Ecolabelled building and a good indoor environment and good health status. This is relevant as our labelling includes homes, pre-schools and now also schools. This means buildings in which children and young people spend a lot of their time.

Even though buildings are a complicated product, Nordic Ecolabelling assesses that is possible to achieve good steerability with environmental labelling of buildings. This is based on experience from versions 1 and 2 of the Nordic Ecolabelling criteria for this product area, and on the development of various other environmental and sustainability labelling schemes within the industry. Steerability is high in the actual production phase, i.e. on construction of the building. There is also high steerability when design, construction and choice of materials influence the operational phases, such as energy consumption and indoor environment.

2.3 Version and validity of the criteria

- In December 2003, Nordic Ecolabelling decided to develop criteria for small houses after a preliminary study had shown good relevance, potential and manageability.
- In 2006 an evaluation was made which showed a clear market interest in the ecolabelling of apartment buildings. In conjunction with the revision of version 1 of the criteria, the product group was expanded to include apartment buildings as well as pre-school buildings. Version 2 was determined in December 2009 with a term of validity up to and including 31 December 2014.
- During the criteria's term of validity, a number of changes and adjustments were made primarily concerning requirements of materials and chemicals. In addition, the product group definition was expanded with extensions to existing buildings, where the extension can be Nordic Swan Ecolabelled.
- The criteria version 2 has been prolonged a couple of times. The current version 2.13 is valid until 31 October 2017.
- Criteria version 3 has been valid since March 2016 and is valid until March 31, 2021.
- During the period of validity of the criteria, a number of changes and adjustments have been made including requirements relating to energy, chemical construction products and chemical content in embedded materials and a few minor

adjustments within the credit module. An extension of the criteria has been decided and current version 3.7 is valid until 31 December 2022.

2.4 Products that can be labelled

As indicated by the criteria document, small houses, apartment buildings and school and pre-school buildings can be ecolabelled. The difference from the previous version of the criteria is that the criteria are expanded with school buildings. This expansion has been in demand from the market and is logical since it has been possible to ecolabel pre-school buildings since December 2009, when version 2 of the criteria was adopted.

Only **new production** of these types of buildings can be Nordic Swan Ecolabelled. An existing building cannot be ecolabelled. There is an exception with regard to extensions to existing buildings, which can be ecolabelled. The extension must be a home, pre-school or school, and only the extension may be Nordic Swan Ecolabelled.

In conjunction with the revision it is stipulated that homes for the elderly or the functionally impaired may be ecolabelled if the building is classed a home and not a care facility. Homes, pre-schools or schools that are temporary, i.e. constructed for a limited time, can also be ecolabelled. This are often called modules, pavilions or annexes. Section 5.1 presents a more detailed description of what is included in the product group definition, i.e. can be Nordic Swan Ecolabelled, and what falls outside. This text can also be found in the introduction to the criteria document.

See chapter 5.2 for more information of what is covered by the requirements.

Nordic Ecolabelling has started a project to develop a separate criteria document for the renovation of buildings. The proposal for criteria for renovation will be sent on a hearing under 2016.

2.5 Who may be licensees?

The rules for Nordic Ecolabelling of products states that licensees may be:

- companies that manufacture the products;
- companies that are solely responsible for a product within a Nordic country (such as an importer, reseller, distributor or similar entity).

For the product group of Nordic Swan Ecolabelled small houses, apartment buildings and school and pre-school buildings, the licensee is ideally, either a contractor, property owner, house builder or other party that can take full responsibility for all requirements. This also means that architects or technical consultants can only be licensees if they can take full responsibility for all requirements.

3 The Nordic market

This chapter is a brief description of the industry in the various Nordic countries, an overview of licences and a description of other labelling and management methods that are relevant for buildings. Appendix 2 presents an overview of the assessment systems and labels that are relevant to construction products. Appendix 3 summarises relevant directives, acts and regulations for this area. The text is written during spring 2014.

3.1 Denmark

The building and construction sector is one of the main industries in Denmark. The building and construction sector include both the maintenance and expansion of Denmark's building stock and infrastructure (such as roads and sewerage systems). Business revenues and employment fluctuate with the economic cycles, and new construction is particularly sensitive to the business cycle. Viewed over a number of years, however, the level of revenue is approximately DKK 240 billion annually, and employment totals approximately 160,000 people. As of 1 January 2014, buildings for full-year residence account for 51% of the total building area. Commercial buildings account for 40%, while the rest of the total building area is buildings use by institutions and buildings for cultural and leisure purposes, e.g. summer cottages[5]. Approximately 40% of the country's total energy consumption takes place in the building stock. If the climate and energy objectives are to be achieved, building and construction is a key player.

The Danish Construction Association has 6,000 member companies and represents most of the companies in the building trade, virtually all construction companies, and a large proportion of materials producers. The Danish Construction Association has identified five important areas of activity:

- Energy optimisation of the existing housing stock
- Development of low and plus energy houses in new construction
- Adjustment and protection from climate change, such as coastal protection tasks and expansion and renovation of the sewerage network, etc.
- Participation in the transition from a fossil-fuel based energy supply system to a system based on renewable energy sources
- Making the construction industry and the construction process climate neutral.

There has been very great focus on sustainable construction, and there are many views on what this is. The Copenhagen Institute for Futures Studies has issued the report entitled "Scenarier for ejendomsmarkedets og byggeriets udvikling frem mod 2015" (Scenarios for the development in the property market and construction up to 2015). They e.g. write that: "Many expected that the economic crisis would push the climate and energy issue into the background, since initiatives here could no longer be afforded. This was not the case, however, but quite the contrary in fact." They believe that there are five strong drivers that put the climate and energy issue at the top of the political and commercial agenda, both now and in the years to come. These are global warming, the wish for less dependency on the oil-producing countries, the expectation of ever-increasing oil prices, the wish for more tax and the wish for new engines to drive growth in the future[6].

Interest in green roofs is increasing. After several torrential cloudbursts, it has become clear that several Danish towns and cities are not designed to quickly take up rainwater. There is thus focus on e.g. using green roofs. The advantage of green roofs is that they take up some of the rain and that the precipitation is led into the drains at a steadier rate, reducing the risk of the drains overflowing and consequential flooding[7].

In 2013 the Danish government has allocated DKK 53 million for use in the period 2014-2016 for organic construction rigs under the Danish Ministry of the Environment's

[5] Statistics Denmark: Building statistics 1 January 2014 Construction and housing.
[6] Scenarier for ejendomsmarkedets og byggeriets udvikling frem mod 2015 (Scenarios for the development of the property market and construction up to 2015), the Copenhagen Institute for Futures Studies, 2010.
[7] http://www.bolius.dk/alt-om/tag/artikel/groenne-tage-der-holder-paa-regnvandet/

Green Technology Programme. The starting point is the wish to strengthen Danish expertise within green technology and organic construction so that Denmark can become better at converting good ideas and projects into competitive solutions. A key aspect of the organic construction initiative concerns subsidies for the testing, development and demonstration of technologies to promote organic and sustainable construction.

3.2 Sweden

After declining in 2011 and 2012, residential construction increased by 50% during 2013 and this positive trend is expected to continue during 2014 and especially in 2015[8]. Apartment buildings mainly account for the increase, but construction of small houses is also increasing. The Swedish construction industry is dominated by the four largest players, which are Skanska, NCC, PEAB and JM, and they have activities all over Sweden. Together these four have a market share of 40%. Sweden has the most concentrated business structure in the Nordic region, and the largest players therefore have a great impact on the construction environment[9].

Environmental certification of commercial buildings has had a great impact in Sweden, and it is customary to request the environmental classification when leasing premises. For private consumers environmental labelling is so far of less significance when choosing a home. Even though Swedes' general environmental awareness has increased in recent years, it is taken for granted that new buildings are based on healthy materials and low energy use. Nonetheless, many homes, both rented and owned, are achieving environmental certification, mainly under the Sweden Green Building Council or the Nordic Swan Ecolabel. Most large construction companies and real estate companies work with environmental classification systems. The Sweden Green Building Council, BREEAM and LEED are well-known in the construction and real estate industry, but with regard to private consumers, the Nordic Swan Ecolabel is by far the most well-known.

In the Swedish construction sector, there have long been many voluntary initiatives to drive the environmental work. For example, there are a number of systems for the environmental assessment of construction supplies (BASTA[10], Byggvarubedömningen[11], SundaHus[12]). These are web-based systems consisting of databases with both chemical substances and construction products. The assessment of construction supplies leads to various ratings, and the systems apply different parameters in their assessments.

In recent years, children's exposure to chemicals has attracted media attention. In 2013, several players, including Miljöstyrningsrådet (the Swedish Environmental Management Council) and Naturskyddsföreningen (Swedish Nature Conservation Society), started up a project to promote pre-schools that are free of toxic substances. The Swedish government has given continued support to the Swedish Chemicals Agency in the work of achieving toxin-free everyday environments and construction products are a priority area.

[8] The Swedish National Board of Housing, Building and Planning 's housing survey of the country's municipalities, Byggvärlden no. 10 2014.
[9] http://publications.lib.chalmers.se/records/fulltext/145201.pdf (p.18)
[10] http://bastaonline.se/
[11] http://www.byggvarubedomningen.se/sa/node.asp?node=455
[12] http://www.sundahus.se/home.aspx

3.3 **Norway**

Approximately 30,000 homes are built annually in Norway, in a normal year[13]. The total sales increase for the residential construction sector in Norway was 17% in 2011[14]. Building, construction and real estate are Norway's third-largest industry in terms of numbers of companies and revenue, and Norway's second largest in terms of value added and employment[15]. Major producers are AF Gruppen, Backegruppen, BWG Homes ASA (Block Watne, Hetlandhus, Myresjöhus, SmålandsVillans), JM Norge, Kruse Smith, Mestergruppen, Norgeshus, NCC Construction AS, Skanska, Veidekke and Obos.

There are around 2,450,000 homes in Norway. 52% of these are detached homes (or farmhouses). 21% are semi-detached homes, row houses and other small houses, while 23% are blocks of flats or apartment buildings. 78% of households own their own homes, while 17% rent their homes. The proportion renting their homes has increased since 1990, and this increase has been seen in towns and cities in particular. Compared to e.g. Denmark and Sweden, the proportion of freeholders is high in Norway. Especially young and single people are increasingly renting their homes, and this development is related to such factors as higher home prices, especially in large towns and cities. In 2014 there were 449,000 holiday homes (cabins, summer cottages) in Norway. More than 20% of all households state that they own a holiday home[16].

The Nordic consumer survey from Response Analyse (2010) commissioned by Nordic Ecolabelling showed that 60% consider it important to think of the climate with regard to their homes and 54% consider this important with regard to construction materials. This means that around one half of today's consumers consider environmental friendliness to be vital in terms of selecting products for their homes. Surveys also show that only 1.4% associate the Nordic Swan Ecolabel with construction materials.

Environment and health are an increasingly relevant topic in the industry and is in greater focus in the marketing of homes and projects. Especially the interior climate and energy efficiency are emphasised in most prospectuses. The interior climate may be expected to become even more important if passive housing becomes the standard as from 2015, in view of the past and current discussions of the consequences for the interior climate.

Many are willing to pay for new services, for example, in order to save time. The Selvaag Pluss[17] concept e.g. includes manned reception areas at fixed times, plus hosting for personal service, opportunities for simple refreshments, delivery of the day's newspapers and magazines, home cleaning, change of bed linen and towels, dry cleaning and shirt service, outdoor maintenance such as snow clearing and gardening, janitor services and help with light practical chores, home security alarms and home security patrols.

The construction sector is generally influenced by the business cycle, which means that it is sector with full speed ahead when the economic climate is favourable, while the brakes are put on when the development is negative[18]. The improvement in the June 2014 sales

[13] http://www.jm.no/om-oss/miljo/
[14] http://www.mestergruppen.no/artikkel/navn/Mesterhus-er-Norges-strste-boligbygger-for-13.gang/10004507
[15] Reve, Torgeir 2007. "En verdiskapende BAE-næring" (A value-adding building, construction and property industry). Presentation at Bygg Reis Deg 18.09.2007.
[16] SSB 2014 "Dette er Norge 2014" (This Is Norway 2014) Published: 11 July 2014.
[17] Selvaag Bolig "Pluss - Det lille ekstra fra Selvaag Bolig" http://www.selvaagbolig.no/konsepter/Pluss/ http://www.plusservice.no/
[18] Reve, Torgeir 2007. "En verdiskapende BAE-næring" (A value-adding building, construction and property industry). Presentation at Bygg Reis Deg 18.09.2007.

of new homes gives hope that the trend for a downturn in home construction is changing[19].

Prognosesenteret[20] expects an increase for all housing types during the next few years. They believe, however, that the strongest increase will be seen for flats, since there will continue to be an increasing proportion of elderly people in the population who typically require this type of housing. Centralisation is also continuing, and in large cities a large proportion of flats are being built. Overall, the population increases strongly each year and SSB expects a population increase of between 60,000 and 70,000 people during the next few years, so that there will also be increasing demand for both small houses and single-family homes.

In addition to the ageing population and centralisation, high housing prices are another reason for the predicted stronger growth for flats. Even though flats are generally more expensive per sq. m. than single-family homes and small houses, they are still smaller, so that they are still generally less expensive. The price is determined by the number of sq. m. and when prices increase the demand for smaller homes will increase relatively more than for larger homes. Since flats are generally smaller, this means that flats will be preferred.

3.4 Finland

This sector (all construction activity) is large, and one of the largest in Finland. Buildings represent approximately 70% of Finland's national assets. Even though residential construction is only part of this sector, it is still substantial. Residential construction employs 140,000 people, equivalent to 6% of employment in Finland. Residential construction was valued at approximately EUR 5.5 billion in 2013. It is significant that 2013 was the first year ever that new construction was below renovation (approximately EUR 6.5 billion). This is related to the age and poor economic position of the housing stock.

Residential construction is also important in an environmental perspective. Homes account for approximately 20% of energy consumption in Finland, of which approximately 80% is used for heating.

Residential construction includes various different sectors: apartment buildings and multi-storey buildings that are dominated by large groups such as YIT, NCC, Skanska, SRV and Peab. Small houses in Finland are either "house packages", where the manufacturer holds full responsibility for the delivery (such as Kastelli-talot, Design-talot, Kannus-talot, Muurame-talot, Jukka-talo) or are self-built, where the builder holds full responsibility for construction and purchases materials from different sources. Besides the 20-30 largest companies there are several hundred companies that build homes.

The volume of residential construction has declined since 2012, primarily as a consequence of the economic situation and consumers' uncertainty. It is estimated that residential construction will decline by a further 1% in 2014, and then increase in 2015. The situation for small houses is particularly severe. The economic situation for multi-storey buildings is better and residential construction is focused on expanding large cities.

[19] http://www.bygg.no/article/1203709 Visited on 12082014 by Ola Rise.
[20] Prognosesenteret, 2012 "Nye boliger NORGE - Prognoser mot 2014" (New homes NORWAY - Forecasts towards 2014).

It is estimated that construction of 18,500 multi-storey or row-house units, as well as 7,500 small houses, commenced in 2014.

The industry began to focus on environmental work 10 years ago. The adjustments have been a slow process and the industry is still considered to be rather conservative. In recent years, however, a lot of effort has been devoted to energy efficiency and other environmental aspects. In future, energy efficiency requirements will be tightened via Near Zero Building (public buildings in 2019 and residential buildings in 2020). As a consequence of these requirements, environmental performance can be expected to become more significant. Other aspects that are far less discussed are a good indoor environment and the climate impact of the construction materials.

3.5 Nordic Swan Ecolabel licences

In December 2016, the following licences per country were reported:

Denmark

- NCC Bolig A/S, Etagebyggeri (apartment buildings and row houses)
- Eurodan-Huse, Århus A/S (single-family homes)
- Lind & Risør A/S (single-family homes)

Sweden

- Skanska Sverige AB (apartment buildings)
- Skanska Nya Hem AB (single-family homes)
- Veidekke Bostad AB (apartment buildings)
- Familjebostäder i Göteborg AB (apartment buildings)
- NCC Boende and NCC Construction AB (apartment buildings and single-family homes)
- STRABAG AB (apartment buildings, concept)
- PEAB Bostad (single-family homes, apartment buildings and pre-schools)
- Ross Architecture and Design AB (single-family buildings)

Norway

- Trygge Barnehager (pre-schools)
- NCC (apartment buildings)
- Trysilhus (row houses)

Finland

- Järvenpään Mestariasunnot Oy (apartment buildings)

Counted as building units this corresponds to (August 2015):

- 250 family houses and almost 900 completed apartments in Sweden. In addition, approximately 1500 apartments and 150 family houses are under construction.
- A bit over 100 apartments and almost as many family houses are completed in Denmark and 225 Nordic Swan Ecolabelled apartments are under construction in Norway.

3.6 Other labels

Besides the Nordic Ecolabelling criteria for construction projects a number of other environmental and sustainability labels are used for construction projects in the Nordic region. Several of these are international schemes, but there are also national schemes such as Miljöbyggnad (Sweden Green Building Council). Below is a brief description of the labelling schemes most commonly used in the Nordic construction sector. All of the schemes described here are life-cycle-based, multi-criteria based and inspected by third parties. However, not all of them are Type I environmental labels, cf. ISO 14024, as some of the schemes are not transparent and are not fixed requirement levels either. All of the labels concern new construction, but some of them also include renovation, and there are also variations in which types of building they cover. The starting point is therefore new construction and the building types that most resemble the Nordic Ecolabelling's product group. Passivhus (Passive houses) are also presented, even though this labelling scheme is mainly an energy labelling scheme and is thus not a multi-criteria label.

Finally, there is a description of Miljövarudeklarationer (EPD = Environmental Product Declarations), which is a type III label.

3.6.1 Green Building Council

Around 90 countries around the world are affiliated to World GBC, which is a network for national Green Building Councils. Green Building Councils are member-based organisations that work in collaboration with the business community and the authorities. It is up to the national GBCs to select the sustainability schemes within construction that they wish to represent. National Green Building Councils are established in Sweden, Norway, Finland and Denmark, but with various different certification schemes for sustainable construction. There are more detailed descriptions of the various labelling schemes in the following sections.

Labelling schemes in the Nordic Green Building Councils:

- GBC-NO has chosen a Norwegian edition of BREEAM,
- GBC-SE represents BREEAM, LEED, Miljöbyggnad and GREENBUILDING.
- GBC-DK has implemented a Danish edition of the German DGNB scheme
- GBC-FI is neutral, but both LEED and BREEAM are used in Finland

There is also Nordic GBC, where the Nordic countries' Green Building Councils meet and collaborate.

3.6.2 LEED

LEED (Leadership in Energy and Environmental Design) is an American certification scheme. The development of LEED commenced in 1993 in conjunction with the establishment of the American Green Building Council, USGBC, and the first LEED Version 1.0 was launched in 1998. LEED has been used for a considerable number of projects, mainly in the USA, but also in a number of other countries.

LEED is divided into schemes for the certification of new construction or the renovation of existing buildings, use of existing buildings, and planning of local areas. Within new construction, criteria documents have been developed for various building

use, such as offices, commerce, homes, schools and so on. LEED's criteria are primarily related to current American guidelines and standards, and American planning and construction practice[21].

All of the categories include minimum requirements in the form of criteria to be fulfilled. In addition, points can be achieved within each category. Depending on the number of points given to the building, it can be certified as Silver, Gold or Platinum.

The actual approval/review is undertaken by a person trained in LEED, who is approved and designated by GBCI. The purpose of the review is to ensure that there is appropriate documentation of the criteria which the project team deems that the building can fulfil.

In LEED the certification can be split into two stages. A design phase and a construction phase. This splitting makes it possible to submit documentation from the design phase, and a provisional review is made of this documentation. The criteria included in the design phase review are hereby finally determined and are not reconsidered in a review after completion of the project. Certification is awarded for the individual project, including the construction site, and this cannot be reused. This would require new certification.

3.6.3 BREEAM – BRE Environmental Assessment Method

The development of BREEAM commenced in 1988 and BREEAM was launched in the UK in 1990, since when the scheme has been used for 20 years in the UK. The official international element of the scheme was launched in 2008 in other countries in Europe besides the UK. BREEAM has developed methods for the certification of new construction or the renovation of existing buildings, use of existing buildings, and planning of areas/local communities. Within new construction, criteria documents have been developed for various types of buildings, such as offices, industry and the retail sector.

BREEAM's point system is built up in around the same way as LEED's, where a number of points is achieved for each criterion fulfilled. At BREEAM the categories are weighted differently, however, and the points are converted to a percentage. In addition, special minimum requirements are incorporated since the scheme sets requirements for the fulfilment of selected criteria in order to achieve certification. The requirements increase with higher classification.

Depending on the number of points given to the building, it can be certified as

- Certified ≥30%
- Good ≥45%
- Very good ≥55%
- Excellent ≥70%
- Outstanding ≥ 85%

Under BREEAM it is obligatory to use an assessor to undertake certification.

[21] Bæredygtigt byggeri - Afprøvning af certificeringsordninger til måling af bæredygtighed i byggeri, (Sustainable construction - Testing of certification schemes for measurement of sustainability in construction), June 2010, Byggeriets Evaluerings Center (Benchmark Centre for the Danish Construction Sector).

BREEAM-NOR

The Norwegian Green Building Council (NGBC) administers this scheme, which is a Norwegian adaptation of the English BREEAM for New Construction. BREEAM NOR was launched on 20 October 2011 and much of the Norwegian construction sector has contributed to adapting the standard to Norwegian conditions. There is thus great support for the scheme in Norway and many clients and contractors are engaged in BREEAM certification of projects. BREEAM NOR covers the following project types: new construction, major renovation, extensions and interior layout. The following types of commercial buildings are covered: offices, industry, trade, education/training (pre-schools, schools, further education/vocational colleges). NGBC has also commenced the work of adapting BREEAM In Use to Norwegian conditions. This standard was launched in October 2013.

Certification is awarded for the individual project, including the construction site, and thus cannot be reused. This would require new certification.

3.6.4 DGNB

DGNB (German Sustainable Building Certificate) is a German certification scheme developed by DGNB (Deutsche Gesellschaft für Nachhaltiges Bauen) (German Sustainable Building Council).

Like LEED and BREEAM, DGNB has developed methods for the certification of both new construction and the use of existing buildings, and the planning of local areas is being developed. Within new construction, criteria have also been developed for various types of buildings, such as offices, commercial buildings and schools.

Green Building Council in Denmark is the only body in the Nordic region to implement a Danish version of the DGNB standard, DGNB DK. The certification is based on 63 criteria in the categories of environmental sustainability, economic sustainability, social sustainability, technical quality, process quality and site quality. DGNB uses a database with a collection of generic and specific data: the ESUCO database (European Sustainable Construction (DGNB International, 2010)). The production technology in the ESUCO database is based on European average industrial data, and a Danish energy mix is used in the Danish edition.

Depending on the number of points given to the building, it can be certified as:

- Bronze ≥50%
- Silver ≥65%
- Gold ≥80%

As for BREEAM, it is also a requirement under DGNB that an auditor is connected to the construction project. These auditors are trained under DGNB auspices. It is also possible to select whether to apply for provisional certification after completion of the design phase. An LCA calculation for the construction project is required. In addition, different kinds of information on the materials used in the building is required, as well as the building structure, so that the overall economy over a lifetime of 50 years can be calculated and the environmental quality can be assessed. Certification is awarded for the individual project and thus cannot be reused. This would require new certification.

3.6.5 Miljöbyggnad

Miljöbyggnad (the Sweden Green Building Council) is a Swedish certification system created by the industry itself and based on Swedish construction and official regulations, as well as Swedish construction practice. The criteria for new construction include homes, offices, schools and other types of buildings. The criteria consist of 18 requirements within the categories of energy, indoor environment and materials. There is no percentage weighting of the requirements, but instead the number of requirements within each category is stated. Within each requirement there are differentiated requirement levels for bronze, silver and gold, and the completed building receives final certification as bronze, silver or gold. There are various assessment criteria for new construction and for the renovation of existing buildings.

It is recommended to use a Miljöbyggnad-trained consultant to collect documentation. The actual application process takes place in an online system. Miljöbyggnad-certification is valid for ten years or until the building is changed so that the certification outcome is no longer fulfilled. The individual project/building is certified.

3.6.6 Active House

Active House is a certification scheme for homes. It includes the areas of comfort/indoor environment, energy and environment. Behind Active House are a number of partners that are contractors and construction materials producers in European countries (mainly Germany, Denmark and the Netherlands). The specifications apply to new production, existing buildings and renovations. So far, the focus has been on single-family homes.

3.6.7 Passive house certification

The Norwegian NS 3700 standard, Criteria for passive houses and low energy buildings, contains criteria for passive houses and low-energy houses. The standard does not deviate significantly from the criteria used in Sweden and Europe in general but takes account of special Norwegian conditions, such as a large number of small homes, and construction in a cold climate. The standard concerns buildings for residential purposes such as detached homes, two-to-four-person homes, row houses and blocks of flats.

The standard states three levels of energy-efficient residential buildings:

- Passive houses
- Low-energy house class 1
- Low-energy house class 2

3.6.8 EU Ecolabel

For several years the EU Ecolabel has worked to develop criteria for buildings. The project has stalled, and no final document has been adopted concerning either labelling or green procurement. The scope is limited to office buildings.

3.6.9 Environmental Product Declarations (EPDs)

An EPD (Environmental Product Declaration) is a verified environmental declaration for a product. An EPD is a Type III environmental label that is originally defined in the EN 14025 standard and, according to this standard, must include information concerning the key environmental characteristics of a product throughout its life cycle. The scheme is primarily for B2B-producers and EPDs are widely used in the construction sector for various construction products. In this case the products are not subject to environmental requirements, so that all products can obtain an environmental product declaration, irrespective of how little, or how much, they impact the environment. The reader therefore requires a good deal of knowledge to be able to assess an environmental product declaration.

Within construction, the standard "EN 15804:2012 Sustainability of construction works - Environmental product declarations - Core rules for the product category of construction products" has now been developed. This standard describes the overall product category guidelines (PCR: Product Category Rules) for the development of EPDs for construction products. The idea is then to develop product-specific PCRs. There are several examples of how companies create EPDs on the basis of EN 15804, if there is no specific PCR for the actual product group. However, this may have the result that important parameters such as the insulation properties of insulation materials are not described in the EPD, which prevents actual comparison with any other insulation product.

To a certain extent it has been ensured that the information is collected and calculated on a uniform basis. This means that it is theoretically possible to compare EPDs for competing products within a product group. However, various different electricity mixes may have been used, for example, which impedes comparison. So far it has been a challenge, however, that there may be different product category rules (PCR) in different countries for the same product group. The PCRs set the terms for how the EPDs should be drawn up. If there are EPDs for the same product group from several countries and they are based on various different PCRs, they will not necessarily be directly comparable since they may have different assumptions/bases. Some Norwegian EDPs state: "EDPs from other program operators than the Norwegian EPD Foundation may not be comparable." This makes it difficult for consumers (and environmental advisers) to compare EPDs for the products. There may also be variations in how many phases of the product's life cycle are included in various EPDs. This should also be taken into account when any comparison is made.

EPDs often do not contain any specific information concerning chemicals that are hazardous to health and the environment that are used in production or included in the product. Furthermore, account is rarely taken of the sustainable cultivation of renewable resources, such as timber.

4 About the criteria revision

4.1 Purpose of the revision

The main purpose of the revision is that the Nordic Ecolabelling criteria continue to ensure environmental improvements, and that the criteria are seen to be attractive, usable and clear to the sector. The revision must consider the areas presented in the evaluation of the product group from 2014. It has previously been decided to expand the product group with lower and upper secondary school buildings.

After the revision, the criteria:

- must give a documented environmental effect and preferably have diminished or at least not increased number of requirements.
- must be more specific so as to minimise the need for interpretation.
- must be more specific so that the criteria document is the only source of information required to submit an application. This will reduce the need for information meetings, telephone calls, criteria guides, and other supplementary reading for the licence applicant.
- must not be too administratively heavy, time-consuming or difficult to document.
- must be adapted for Norway, Finland, Sweden and Denmark.

The revision has the following sub-objectives:

- expand the product group with school buildings[22,23].
- adjust requirements as needed to that they also apply to homes for the elderly and mobile modules/pavilions that today are already covered by the product group definition.
- when the criteria have been adopted, launch a construction product database according to the requirements found.
- consider opportunities to reduce the number of requirements and/or simplify the documentation requirement without losing the environmental benefit.
- revise current energy requirements to also be reasonable during the validity of version 3 of the criteria and analyse how better manageability can also be achieved for the measured/actual energy consumption.
- investigate what can also be defined as "renewable energy that is produced on site or in the vicinity" in accordance with the EU Directive on the energy performance of buildings (2010/31/EU), in order to specify that the labelling also concerns climate issues.
- analyse the opportunity to remove any counter-productive obligatory requirements such as individual measurement of heating energy.
- raw up requirements of the intrinsic energy in any relevant material(s), such as concrete and cement.

[22] Extensions to school buildings will be included automatically since extensions to the types of buildings included in the product group definition are already included.
[23] School buildings can also be used for leisure time activities for the younger schoolchildren outside school hours. But the buildings are primarily intended for schools and are therefore still called school buildings. Separate buildings for leisure time activities are included in the concept of school buildings and may also be Nordic Ecolabelled.

- prioritise material requirements that give the best possible environmental benefit and also constitute a reasonable workload for administrators and for applicants.
- introduce requirements for the reuse of materials and specify timber requirements in accordance with the result of the evaluation of timber requirements under Nordic Ecolabelling.
- expand opportunities to take points for ensuring increased flexibility. Increase incentives to use Nordic Swan Ecolabelled products.
- strengthen the link to health and a good indoor environment.
- handle other improvement opportunities arising during the evaluation.

4.2 About this revision

The project was started in the spring of 2014 and has continued into 2015. Sara Bergman, with Nordic responsibility for the Construction area, has served as project manager. Other project members were Elisabeth Kolrud, Elisabeth Magnus, Heidi Belinda Bugge and Stinus Kappel Andersen. Administrators and experts from the respective Nordic countries also made worthwhile contributions to the project. Karen Dahl Jensen holds the position of Nordic product development manager and commissioned the revision.

During the revision Nordic Ecolabelling held four working meetings/workshops with invited representatives from the sector. The results of these working meetings were of great value to the work. In addition, many contacts were made in order to obtain information, including via physical meetings, telephone meetings and mails. Nordic Ecolabelling would like to thank all external stakeholders that contributed to the process.

5 Justification of the requirements

This chapter outlines proposed revised requirements of version 3 of the criteria and also provides the background to why the requirement is made, the proposed requirement level and any delimitation. The appendices referred to in the respective requirements are the appendices to the criteria document.

5.1 Product group definition and delimitations

The chapter begins with a section setting out the product group definition and the changes made to the definition compared to version 2.

This is included in the product group definition
The Nordic Ecolabelling criteria for Small houses, apartment buildings and buildings for schools and pre-schools make it possible to achieve a Nordic Swan Ecolabel for newly constructed buildings. The background text below presents further information.

- Small houses.
- Apartment buildings.
- Buildings for pre-schools and schools/educational buildings.
- Extensions to existing buildings. The extension must be a home, pre-school or school, and only the extension will be ecolabelled.
- Homes for the elderly that are classed as homes in the country´s building code and of the actual municipality. The same applies to residential institutions for

persons with physical or mental functional impairment. Shared areas for the home's residents and staff areas are also covered by the Nordic Swan Ecolabel and must fulfill the requirements.

- Cottages/holiday homes and holiday apartments, provided that the building is not exempt from the national building permit regulations, are heated, has running water and sewage approved according to local regulations. A cottage/ holiday home must fulfil the energy regulations in the national building regulations for small houses for permanent residence, without any simplifications or easing due to size, etc. Holiday apartments must fulfil the requirements for apartment buildings.
- Homes, pre-schools and schools that are temporary, i.e. constructed for a limited time. This are often called modules, pavilions or annexes.

Small houses include single-family houses, row houses, terraced houses and semi-detached houses if the building regulations in the country doesn´t have another definition.

Licences can be given for fully controlled concepts as well as unique projects. A deviation from the building type and layout may be made if the variations fulfil the requirements in the criteria document. This means that both the standard performance and optional of for example kitchen fittings and white goods must fulfil the requirements.

A building is Nordic Swan Ecolabelled on its completion/occupation/implementation. It can be communicated that the building achieved Nordic Swan Ecolabelling a specific year: "Nordic Swan Ecolabelled 201X". As required, the current version number of the criteria can be stated. Nordic Ecolabelling is not responsible for the building's fulfilment of the criteria at any later time, such as after renovation.

In section 2.5 is outlined who can be the licensee.

This is not included in the product group definition
On the other hand, the following buildings may not be labelled:

- Permanent supplementary buildings, such as garages, refuse depots, bicycle sheds, sheds [24] and so on must fulfil relevant requirements in the criteria, but may not themselves be Nordic Swan Ecolabelled.
- Separate educational buildings, that to a major extend accommodate laboratories, workshops and similar cannot be Nordic Swan Ecolabelled.
- Separate buildings such as gymnastics halls, ball sports halls, swimming halls, etc. cannot be labelled either themselves or as part of the labelling of a school building, even if they belong to the school. This means that when a school and a sports hall are built, the school building can be labelled, but not the separate sports hall. On the other hand, exercise rooms, sports rooms and so on that are integrated in the pre-school/school building may be included in labelling and in such case must fulfil all relevant requirements.

[24] Instead, they can be labelled under the criteria for Nordic Ecolabelled Outdoor Furniture and playground and park equipment.

- Hospitals, other care facilities and care homes that either is not used as permanent homes or is classified as premises may not be Nordic Swan Ecolabelled.

Background

Since the first version of the criteria it has been possible to achieve Nordic Swan Ecolabelling of small houses (family houses, detached, semi-detached houses row houses and terraced houses regardless of the form of tenure) intended for permanent residence. In conjunction with the development of version 2 of the criteria, adopted in 2009, it also became possible to achieve Nordic Swan Ecolabelling of apartment buildings, whatever the tenure status, i.e. rented, owned, cooperatively owned, etc., as well as pre-school buildings.

Expansion to include schools

A result of the revision is that school buildings are subject to the criteria and can be labelled. This means that both buildings for lower and upper secondary schools are included as well as buildings for higher education and training. A Nordic Swan Ecolabelled school building may also include areas or buildings for leisure time use, i.e. facilities for pupils at the school after the end of the compulsory school day.

Related sports buildings such as gymnastics halls, ball sports halls, swimming halls, etc. cannot be labelled either themselves or as part of the labelling of a school building. Sports halls are often more detached than school buildings. They are often rented out to external players and often have their own utilities services (water and electricity).

Separate educational buildings, that primarily accommodate laboratories, workshops and similar operations that often imply different functions regarding ventilation, lighting etc. cannot be Nordic Swan Ecolabelled. This does not prevent a Nordic Swan Ecolabelled school building from accommodating laboratory rooms for chemistry, physics and biology and lecture rooms for handicraft and art.

Homes for the elderly

Homes for the elderly are residential institutions for the elderly who cannot or will not live independently. There are various categories of homes for the elderly, with great similarities between the Nordic countries[25]:

- Housing for senior citizens (also called 55-plus housing, lifestyle housing, etc.) which are normal homes with increased opportunities for social interaction. The idea is that these should be straightforward and comfortable homes to grow old in.
- Sheltered housing bridges the gap between ordinary housing and special housing with 24-hour care.
- Care and nursing homes/homes for dementia patients and so on, with 24-hour services.

[25] Metoder och nyckeltal för uppföljning av äldreomsorg i Danmark, Norge, England och Kanada. (Methods and key figures to follow up on care of the elderly in Denmark, Norway, the UK and Canada.) 2009, the Swedish National Board of Health and Welfare.

All homes for the elderly (and also residential institutions for persons with physical or mental functional impairment can be Nordic Swan Ecolabelled as long as the building is classed as homed in the country´s building code and by the municipality.

Nordic Ecolabelling's position is that as few square metres as possible must be excluded from the Nordic Ecolabelling requirements. The basic rule is that the same requirement must apply, whether ordinary apartment buildings or homes for the elderly are constructed. All communal areas intended for the residents of the home for the elderly and its staff are also subject to Nordic Swan Ecolabelling and must fulfil the requirements. But commercial areas such as a shop, hairdresser or foot care are excluded in the same way as ordinary multifamily dwellings.

Extensions
Extensions to existing buildings may be Nordic Swan Ecolabelled provided that the following conditions are fulfilled:

- The extension must include all of the elements and functions required for it to function as a separate unit. Entrance, stairs, laundry room, refuse room and similar functions may be shared with the existing building.
- New production rules according to national legislation and practice must be applied to the entire extension.
- The energy consumption of the extension must correspond to the Nordic Ecolabelling's O4 energy requirements. Energy calculation to verify the requirement must be performed for the extension and fulfil requirements for new buildings.
- Other requirements must only be applied to the extension and to communal elements of existing buildings that are newly produced or installed.

Temporary buildings
A module/pavilion is a temporary building that is built on a site with a temporary building permit. The product group definition specifies that this type of module can also be labelled if the module fulfils the Nordic Ecolabelling requirements. This was also the intention in version 2 but was not clearly communicated. Only modules that are used as housing, pre-schools and lower secondary schools, i.e. have the same scope as version 3 of the criteria, can be Nordic Swan Ecolabelled. A module pre-school that is withdrawn cannot thereafter be rented out/sold as e.g. a Nordic Swan Ecolabelled office module.

The temporary building must fulfil all of the relevant requirements in the criteria in the same way as an ordinary building for permanent residence. This means, for example, that the same energy requirements as for permanent building in the national building regulations, must be fulfilled without simplifications or special agreements made with the responsible authority.

The building regulations that applied at the time of the module's manufacture (when it leaves the factory) must in principle apply throughout the module's lifetime. Licensees of the module may market the module as Nordic Swan Ecolabelled in conjunction with the first lease of the module. At the next lease period they must prove that the module still fulfils the requirement to be able to continue to market the module as Nordic Swan Ecolabelled. Materials and chemical products used in renovation or refreshing must also fulfil the requirements as well as other changes that implies the energy performance or

the indoor environment. They this cannot be fulfilled, the module can only be marketed as having been "Ecolabelled 201X according to version Y of the criteria".

The modules/pavilions covered by the criteria must not be confused with portable cabins at construction sites that are offices/cloakrooms/kitchens and canteen rooms for construction site workers.

5.2 What is subject to the requirements?

It is the building including any permanent supplementary building that is constructed together with the Nordic Swan Ecolabelled building or included in the project/assignment and is marketed with the Nordic Swan Ecolabelled building that are subject to the requirements[26].

The requirements concern the entire building/building carcass. Commercial areas such as shop premises, hair dresses, offices, etc. are excluded. On the other hand, the building's communal areas for residents such as gyms and hobby rooms are included.

Supplementary buildings are e.g. garages (whether the garage is a separate structure or directly connected to the building), refuse depots, bicycle sheds, sheds and similar. Supplementary buildings must fulfil all relevant requirements but may not receive separate labelling. This scope is the same as version 2 of the criteria, except that basements without living space were not subject to the requirements. The licence applicant must be able to document to Nordic Ecolabelling that all of the requirements in the criteria are fulfilled.

A base plate must be insulated against heat loss, moisture penetration and, when required, also protected from radon penetration. Nordic Ecolabelling therefore sets materials and chemicals requirements of the insulation of the base plate (which may be below the plate, above the plate, or both, see Figure 1), and any radon barrier (wherever it is placed). In brief, Nordic Ecolabelling sets requirement for anything above the capillary layer. Nordic Ecolabelling does not set any requirements of the layers **below** the insulating and radon-protected base plate. This means that Nordic Ecolabelling does not set requirements on single, gravel or similar even if these layers have an isolating function[27]. Nordic Ecolabelling does not set requirements on the pipes laid under the plate, such as drainage pipes in the capillary layer, see Figure 2.

[26] In criteria version 2 the term "marketed with the Nordic Ecolabelled building" was used.
[27] The capillary layer can influence the presence of radon and is then to be handled by the radon-requirement (O9).

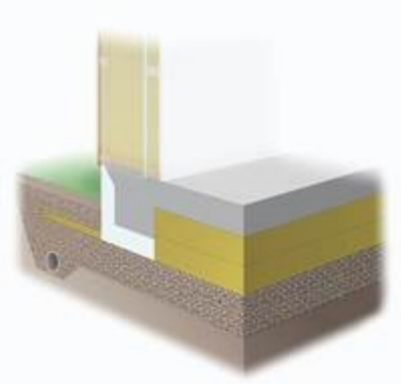


Figure 1: A ground slab can be insulated under the concrete, above the concrete, or both under and above the concrete. This picture shows the insulation (yellow) under the concrete.

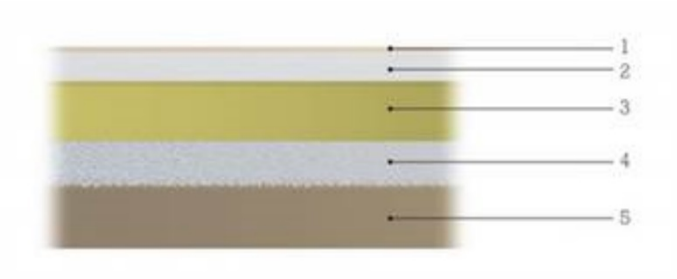


Figure 2: A ground slab normally consists of several layers and a theoretical structure is: 1. Floor covering, 2. Concrete slab, 3. Heat insulation, 4. Capillary layer (single, gravel) and 5. Ground

Installations up to the building are not included. This e.g. means that electrical cables up to the main fuse box are not included, nor are sewerage pipes up through the base up to pipes connected from inside the building.

Whenever anything that would normally have been built on site is purchased as pre-fabricated the same requirements apply as if it has been built on site. This is described further in section 5.6.

The requirements to be fulfilled are those that apply at the time of the commencement of construction, i.e. as the base plate or basement floor is laid. The only exception is the energy requirement, which is fixed with the energy calculation in conjunction with the building permit process, and thus applies from the time of receipt of the building permit or when starting clearance is given.

The basic principle is that the licensee is entitled to construct Nordic-Ecolabelled buildings in line with a specific version of the criteria for as long as the planned completion of the building or stage of the building takes place before the expiry of the version of the criteria in question.

5.3 General requirements

The appendices referred to in the requirement text are the appendices that are found in the criteria document.

O1 Overall description of the building

The application must include an overall description of the building(s) to be labelled. The description must include:

1. Details of the number of storeys, number of square metres of living space in usual terminology, and details of any premises/commercial space.
2. Statement that the Nordic Swan Ecolabelled building includes measurement of household electricity for each residential unit (also called individual household electricity metering). Pre-school and school buildings shall include measurement of the operation´s electricity consumption at least for the operations as a whole.
3. A description of the building or building type's type of carcass/bearing structure, façade, roof, foundations, heating system and ventilation system.
4. Details of any supplementary buildings such as garages, storerooms, bicycle storage rooms, refuse depots, etc.
5. Details of any lifts, as well as balconies and terraces.
6. Details of any options for various layouts or materials and fittings.
7. For pre-schools and schools, the type of activities must also be described, as well as the estimated number of departments, grades or similar.

✉ Documented description of the aforementioned items. Drawings, designs, illustrations or other project documentations can make up the basis.

Background

The requirement is in principle the same as in version 2 of the criteria but has been clarified and made more straightforward. The purpose is to give an overall picture of the building that is to be Nordic Swan Ecolabelled, so that licence administration is correct and effective. Drawings, designs, illustrations or other project documentations should make up the basis of item 1 to 5.

The area must be reported according to each country's current definitions and calculation method.

The requirement is supplemented with a sub-requirement that for Nordic Swan Ecolabelled buildings the household electricity must be metered for each residential unit. The reason is that the requirement of individual energy metering has been removed - see the energy section below). It is obvious that consumption of household electricity is metered for each small house and flat (residential unit) in an apartment building. This is also normal for a newly built pre-school and school. If the Nordic Swan Ecolabelled school has areas intended solely for leisure time activities, this may be included in the school's electricity metering. Residential unit is defined as a flat or small house. With the regard to pre-schools or schools, it is sufficiently for electricity to be metered for the school or pre-school overall, and not by department or equivalent.

O2 Responsibility for Nordic Swan Ecolabelling

The licensee must be responsible for all requirements in the criteria document and for the fulfilment of the requirements, no matter who the work is performed by, until the building is ready for occupation. If subcontractors are used, for example, the licensee is responsible for the subcontractor being informed of the requirements and being held responsible for their fulfilment.

There must be a documentation of the client, (building) contractor, any use of subcontractors, type of contract and responsible contact person towards Nordic Ecolabel for the project.

Reference must be made to requirements O33 and 034.

Certain exemptions may be made from the basic rule concerning the licensee's responsibility for all requirements. See Appendix 2.

✉ Description as stated above.

Background

The purpose of the requirement is to ensure that the licensee takes full responsibility for the fulfilment of all the requirements. This naturally applies to both process/routine requirements and those linked directly to the Nordic Swan Ecolabelled building. The requirement must not be interpreted to mean that only turnkey contracts are accepted as the type of contract. The requirement has a new name in order to specify that the responsibility applies to all requirements under the criteria document.

After the revision, the requirement is in principle the same, but has been reworded in order to apply both when the licensee is the client and in cases where the licensee has the role of contractor. The requirement now refers to Appendix 2, which contains the exemptions that can be made from this responsibility. For example, it is possible to build Nordic Swan Ecolabelled small houses in which white goods have not been installed, provided that this does not infringe national legislation. The same applies to flats in apartment buildings. However, kitchen fittings and white goods which fulfil the criteria for Nordic Swan Ecolabelled fittings and Nordic Swan Ecolabelled white goods, respectively, are recommended.

O3 Points achieved

The licence applicant must receive at least a certain number of points in order to be granted a Nordic Swan Ecolabel licence. The point requirements are stated in chapter 8 of the criteria document.

- For apartment buildings at least 17 out of 44 possible points must be achieved. For Finland only 16 points must be achieved.
- For small houses at least 16 out of 42 possible points must be achieved. For Finland only 15 points must be achieved.
- For pre-school and school buildings at least 15 out of 39 possible points must be achieved. For Finland only 14 points must be achieved.

✉ Description and assessment of the points that the licensee intends to achieve. Appendix 3 can be used.

Background

The point requirements have been moved to the end of the criteria, after all of the obligatory points. There are equivalent requirements (O43) in version 2 of the criteria, but in the revision the number of possible points is expanded, and certain point requirements have been removed and other point requirements are added. Even for the point requirements left unchanged, the number of points that are given has been revised. More points can be granted for energy from local, renewable energy source and form the use of Eco labelled construction products.

Previously, 9 out of a total of 22 points had to be achieved, equivalent to 40%. Now it is proposed at 16 out of 42 possible points for small houses, 15 out of 39 for pre-school and school buildings and 17 out of 44 possible points for apartment buildings. Since the

possibilities for points has increased this shall not be interpreted as a weakening. Since many point requirements are completely new and others have lapsed, comparison is not possible.

On 29 March 29, 2017 The Nordic Criteria Management Group decided to lower the point sum to be achieved, but only for Finland. The cause is that Ecolabelled construction products are available to a lower extent in Finland, which makes it more difficult to achieve points.

5.4 Resource efficiency

5.4.1 Energy and climate

Buildings' energy performance - introduction

The following energy requirements were stated in version 2 of the criteria for Nordic Swan Ecolabelled buildings:

- Energy consumption may be maximum 75% of the upper threshold of the energy management requirements according to the current national building regulations. If new national rules for energy management in buildings are introduced during the criteria's term of validity, Nordic Ecolabelling's requirement will be updated.
- Point requirements that reward further reduction of energy consumption.
- Point requirements that reward energy supplements from local solar collectors, solar cell panels or heat recovery from hot water consumption.
- There are also obligatory requirements of interior and exterior lighting, energy-labelled white goods and individual energy metering.
- Requirement on air permeability testing and limits for air permeability.

Experience from the licensing of Nordic Swan Ecolabelled buildings as shown so far, the energy requirements have functioned relatively well. Yet, it is clear that in step with the tightening of countries' energy regulations for new construction in order to gradually approach nearly-zero-energy level, the Nordic Ecolabelling requirements (25% reduction) are a challenge that the revision must handle. For Finland, which already in 2012 considerably tightened the energy requirement in the building regulations, there is, however, a need to adjust the current level. This is described further in the Background to requirement O4.

Comparisons are difficult to make

National requirements of energy performance/energy efficiency are not directly comparable between the Nordic countries since the various countries' requirements concern various aspects of a building's total energy consumption (tapped hot water, fans, etc.) Other important differences concern parameters such as net energy requirement, energy purchased/delivered and primary energy. In addition, areas are calculated in different ways in the Nordic countries, which justifies comparison of normalised figures in relation to area. This is e.g. summarised in a report from SINTEF Byggforsk dated 2010[28].

[28] Schild, P. Klinski, K, Grini, C. Analyse og sammanlinkning av krav til energieffektivitet i bygg i Norden og Europa, (Analysis and comparison of energy efficiency requirements for buildings in the Nordic region and Europe) SINTEF Byggforsk, 2010.

In 2012 the Swedish National Board of Housing, Building and Planning wrote a PM[29] in which they compared energy regulations for new buildings in the Nordic countries and in Germany. The National Board of Housing, Building and Planning stated that they did not find a single requirement that was exactly matched in any other country's regulations. In the same PM they also write that in February 2011 their Danish counterpart, the Danish Business Authority, reported its investigation of strategies for low-energy buildings in the EU member states. This states that "Comparison of existing energy frameworks is impossible". In summary, the National Board of Housing, Building and Planning states that comparison of various countries' energy requirements is not immediately possible. Apparently similar requirement specifications often prove to include elements that make it impossible to determine which country has the strictest requirements. On this basis it is unrealistic to expect Nordic Ecolabelling to be able to draw up joint Nordic energy requirements. It would not make sense either for Nordic Ecolabelling to develop its own energy requirements. Project design according to two different systems of requirements, making two different energy calculations, would only increase the administrative burden.

Directive on the energy performance of buildings
In May 2010 the EU adopted a Directive on the energy performance of buildings (2010/31/EU). This uses the term "nearly-zero-energy buildings" (NZE). The Directive entails that:

- By no later than 31 December 2020 all new buildings must be nearly-zero-energy buildings.
- New buildings used and owned by public authorities must be nearly-zero-energy buildings after 31 December 2018.

The Directive states that a nearly-zero-energy building is a building with very high energy performance and the low energy contribution must be from renewable energy sources that are produced on site or in the vicinity. The more exact definition of nearly-zero-energy buildings is left to each member state to compile and add to its own legislation. Each country is entitled to take the national conditions into account. An interim target was already set in 2015, whereby 30% of all new buildings must have halved their energy consumption compared to current building regulations. Among the Nordic countries Denmark is a pioneer in this area as they have a roadmap to gradually achieve this interim target.

Whatever our Nordic countries decide is to apply to nearly-zero-energy buildings, it can be stated that a lot has been achieved, but that buildings also need to be even more energy efficient in the future. This presents challenges for the industry but is necessary if we are to have a chance of overcoming the energy and climate challenges that we face.

The purpose of the energy requirements in the criteria for Nordic Swan Ecolabelled buildings is to provide the security that a Nordic Swan Ecolabelled house, pre-school and school has sound energy performance, in parallel with several other requirements to ensure good performance in terms of materials, building quality and indoor environment.

The requirement of the building's energy consumption (O4) is supplemented precisely as in version 2 of the criteria with energy requirements that reduce the use of household

[29] Comparison of energy regulations in the Nordic countries and Germany. The National Board of Housing, Building and Planning 2012. Journal no. 1271-5280/2011.

electricity/commercial electricity. On the other hand, the point requirement that made it possible to achieve points for even better energy performance than the obligatory requirement has been removed. The reason is described later under the headline "point requirement removed".

O4 Energy consumption of the building

For a Nordic Swan Ecolabelled building the energy consumption per year may not exceed:

- **Denmark:** 90% of BR18 or 100% of Low energy class.
- **Sweden:** 85% of BBR 24 or 90% of BBR 25/BBR 26/BBR 29 for apartment buildings and buildings for pre-schools and schools. 80% of BBR 24 or 85% BBR 25/BBR26/BBR 29 for small houses.
- **Norway:** 75% of TEK 10 or 85% of TEK17 for small houses and buildings for pre-schools and schools and 90% of TEK17 for apartment buildings.
- **Finland:** The requirement for housing is energy class A according to the Ministry of the Environment's regulation for buildings' energy performance (1010/ 2017). For pre-schools and schools applies 85% of the regulations limit of 100 kWh/m^2. For requirements according to previous regulation, see*.

The transitional periods set by the national authorities also apply to the fulfilment of the Nordic Ecolabelling's energy requirements.

If new national regulations and thresholds for buildings' energy consumption are introduced during the criteria's term of validity, Nordic Ecolabelling will perform a new assessment of the energy requirement and may adjust the requirement, including the percentage rate, in relation to the new regulations. The adjustment is made in a national consultation round.

For extensions to existing buildings the energy requirement must be fulfilled by the extension. The energy calculation must be made for the extension and fulfil the requirements for new buildings.

The energy calculation must be performed in accordance with:

- BE18 or equivalent in Denmark.
- BBR, valid regulation (BEN) and National practice in the sector for Sweden, see Appendix 4.
- NS 3031 in Norway.
- Ministry of the Environment's regulation for buildings' energy performance or equivalent in Finland.

* *Energy class B according to the Ministry of the Environment's regulation for buildings' energy performance, 2012. For multi-storey apartment buildings connected to district heating the requirement is 85% of the Ministry of the Environment's regulation for buildings' energy performance, 2012.*

✉ Energy calculation. If the energy consumption varies with different building configurations it must be specified that each configuration in the application fulfils the requirements. Alternatively, the requirements must be fulfilled for the building configuration that has the greatest energy consumption (a worst-case consideration).

Background

Energy optimisation is a necessary and cost-effective measure to tackle the climate challenge. Actual energy optimisation can mainly be achieved by reducing the building's energy requirement via better insulation, better windows, etc. This can be achieved by making energy requirements of the buildings. Energy efficient building must naturally at the same time show good performance regarding parameters such as ventilation, daylight etc.

Nordic Ecolabelling has held two workshops with invited external energy experts to discuss possible new energy requirements. In principle the participants agreed that it would be best if the Nordic Ecolabelling requirements could be disconnected from the authorities' energy requirements for buildings. In this case the requirement would be fair and comparable across the Nordic region and make it possible for a Nordic Swan Ecolabelled concept in one country to be introduced on the market in another Nordic country without any adjustments, which has been in demand among e.g. various contractors.

There was also discussion of various alternative ways of making requirements such as output loss, heat transfer coefficient (U_{mean}), releasing all behaviour-driven energy items, relating to the Passive building standard or completely removing the requirement of the building's energy consumption. Despite the weaknesses of the current requirement structure, it was noted that it is unreasonable that Nordic Ecolabelling must create its own standardised calculation of a building's energy consumption that will apply to the entire Nordic region. When the Nordic countries have such different energy regulations that it is not possible to compare them it would be basically impossible to construct a common requirement suitable for the whole Nordic region.

The way forward is, after all, a requirement which entails that a "Nordic Swan Ecolabelled building must be X% better than national energy requirements in building regulations", provided that X is a higher figure than 75, and that the percentage rate must be reviewed when the country's authorities amend their rules. On this basis, Nordic Ecolabelling proposes the following requirements for consultation concerning the criteria:

- The requirement of X% better than national building regulations is differentiated for various different countries and in some cases also for different types of buildings. This achieves greater flexibility and better adjustment. If/when a country changes its energy requirement levels, all the other countries do not also have to change theirs. The scope for greater improvement in one country can be used even if equivalent potential is not found in another Nordic country. See O4 above for the various percentage rates or corresponding.
- When a country introduces new energy regulations on the way to achieving NZE buildings, Nordic Ecolabelling performs a new assessment of the energy requirement and adjusts the requirement and percentage rate according to the new rules and level of legislation for buildings' energy consumption. The proposal is sent for consultation in the Nordic countries concerned.

Exemptions or simplifications
A certain percentage lower than the Nordic countries' requirement concerning buildings' energy use expressed in kWh/m^2 and years applies generally, and to all buildings to be Nordic Swan Ecolabelled. Just as the requirement also states, several exemptions or simplifications found in the Nordic countries' building regulations cannot be used. This applies, for example, to the exemption from the requirement concerning the building's energy use for holiday homes, other types of houses that are not used all year round, greenhouses, timber houses or small buildings below, for example, 70 or 50 m^2.

On the other hand, the adjusted energy regulations/threshold values expressed in kWh/m^2 A_{temp} and years found in the Swedish building regulations for buildings with small flats of maximum 35 m^2 apply.

Adjustment for Finland
For Finland, adjustment is also made for the tightening of the Finnish building regulations that already came into force in 2012. Nordic Ecolabelling's requirement of 75% in version 2 of the criteria was originally targeted at the previous Finnish building regulations and when this was not changed it became far too strict in practice, especially for apartment buildings. The building regulations from 2012 still apply when version 3.0 of the Nordic Ecolabelling criteria is adopted. A proposal for new nearly zero-energy-regulations was published on 2015-03-31 under the Finzeb project. The project's final report states that the tightening from the current building regulations is proposed to vary considerably by building type. For apartment buildings a tightening of 11% from the current E number is proposed, while for schools the tightening is 39%, and for pre-schools 37%. For larger small houses the Finzeb requirement is unchanged, while a tightening for the smallest houses is proposed.

This entails that for apartment buildings the Nordic Ecolabelling requirements in version 2 of the house criteria that the house must achieve 75% of the 2012 building regulations are considerably tighter than Finzeb's proposal for nearly zero-energy E numbers. This is not fair and therefore the limit is adjusted and Nordic Swan Ecolabelled buildings in Finland shall fulfil Energy class B according to the building regulations. To fulfil Energy class B entails that the Nordic Swan Ecolabelled building have 18-27% less energy use than the legislative level, depending on the size and type of the building. This spread shows the challenge of having a certain percentage improvement as an alternative.

Adjustments during the criteria's period of validity
On 17 January 2018, following a national mini consultation process, the energy requirement for Finland was adjusted in response to a new directive on the energy performance of buildings (1010/2017) which came into force on 1 January 2018. The new regulations come into force so that buildings for which planning permission applications are submitted after 1 January must comply with the new regulations.

The requirement that energy efficiency class B must be met for all buildings, except for high-rise/apartment buildings connected to a district heating system, which must meet maximum 85% of the building regulations' level, has been amended. Instead, residential properties must now meet energy efficiency class A. Furthermore, the district heating exemption no longer applies, since the new building regulations no longer favour these buildings. For high-rise apartment buildings, A class equals 17% lower energy consumption compared with the regulatory requirement level.

Under the new regulations, schools and pre-schools will quite easily meet energy efficiency class A (10% lower energy consumption). The requirement level for these buildings will therefore be 85% of the building regulations' level. This ensures that different types of buildings are treated on a similar level.

On 31 January 2018, following a national mini consultation process, the energy requirement for Sweden was adjusted in response to new energy regulations which came into force in the Swedish Building Regulations BBR 25. Since the requirement level in earlier BBR regulations and BBR 25 is basically the same, the requirement is only updated with reference to the new directive and regulation. The percentages are the same as in the current criteria. Two specific requirements are being introduced to handle extreme cases where the impact of the new energy regulations in BBR 25 is greater than before:

For the municipal districts that have been given a geographic conversion factor of 0.8, the requirement is 90% of BBR 25 instead of 85% of BBR 25. This applies to five municipal districts in south-east Skåne, including Malmö.

It is particularly difficult for small, detached, single-family homes to meet the requirements of the new energy regulations. Single-family homes with a living area of 130 m^2 or less must therefore instead meet 85% of BBR 25. 130 m^2 was chosen as the area as this is the proposed breakpoint for area correction in the Swedish National Board of Housing's (Boverket) impact assessment.

The energy requirement in the Swedish Building Regulations BBR for premises for schools and pre-schools is much less demanding than for housing. No changes are made for schools and pre-schools.

A couple of respondents to the consultation point out that BBR 25 makes it difficult for apartment buildings with exhaust air heat pumps to meet Nordic Ecolabelling's requirements. The Swedish National Board of Housing (Boverket) is aware of this problem and it can be assumed that this is a political strategy – that apartment buildings should not be heated using exhaust air heat pumps but should rather be heated using district heating or ground-source heating. Nordic Ecolabelling will not go against Sweden's and the Swedish National Board of Housing's strategy and is not making any adjustments for apartment buildings with exhaust air heat pumps.

On November 28, 2018, after a national referral, the energy requirement for Sweden was adjusted. The principle that the level of requirements should not be tightened under the current criteria generation is fundamental in not changing the commercial and technical conditions for the licensee's signed agreement with Nordic Ecolabelling. Therefore, it was decided to raise the percentages in requirement O4 (to 90% for multi-family houses and 85% for single-family houses) to handle the hidden sharpening that the transition to primary energy entails. At the same time the two exceptions are removed.

In February 2019 requirement O4 has been updated for Denmark with reference to new BR18.

On June 23, 2020, after a national referral, it was decided to maintain the energy requirement for Sweden. The introduction of near zero energy buildings in Europe has been going on for a long time and is therefore not new. The new energy rules in BBR2020: A provide both relief and tightening depending on the type of house and the choice of energy source. The energy requirements of the Nordic Ecolabel are set on the calculated energy consumption, and therefore it is important that there is a certain margin for actual, measured energy consumption. All in all, Ecolabelling Sweden considers it most appropriate to maintain current percentages when BBR2020: A comes into force.

Energy calculation requirement
The requirement is verified exactly as before with an energy calculation. In order to achieve good quality, the requirement is supplemented with how the energy calculation must be performed either in accordance with national standards or with practice in the industry. The quality requirements applying to the energy calculation can be found in appendix 4 of the criteria document.

If the energy consumption varies according to different configurations of a concept (number of different flats, design of the building, etc.) the licence applicant must prove

that each configuration that is to be labelled fulfils the energy requirement. Alternatively, the energy calculation is performed for the building configuration with the greatest energy consumption (a worst-case calculation). The licence applicant must then state in writing why this building configuration is assessed to have the poorest energy performance.

More facts about the current and coming national building regulations can be found in Appendix 5.

O5 Lighting management

For any building, outdoor lighting must have automatic demand control. The requirement does not apply to private balconies, patios, terraces and similar.

In apartment buildings, the indoor lighting in general/communal areas such as entrance halls, stairs, laundry rooms, storerooms, etc. must have automatic demand control.

In pre-schools and schools all indoor lighting must have automatic demand control. The requirement does not include workplace lighting, worktop lighting and lighting fitted into technical installations and equipment.

Lighting of lifts and emergency lighting are exempt from the demand control requirement.

Automatic demand control entails automatic light adjustment to match lighting to the requirements. Management based on time, daylight, acoustics or movement are examples of automatic demand control/detectors that can be approved. The lighting control must be connected to the fixture and not only to/in the light source.

✉ Reporting of demand control for indoor and outdoor lighting in accordance with the requirement.

Background

The purpose of requiring demand control of lighting is to match lighting to the requirement: Energy can be saved by only using the lighting that is needed and avoiding using lighting when it is not needed. In version 2 of the criteria, Nordic Ecolabelling required automatic control of outdoor lighting when the outdoor lighting totals or exceeds 30 Watt. In this revision the output limit has been removed and the requirement entails that all outdoor lighting must be demand controlled. The requirement does not apply to private balconies, patios and terraces, i.e. which belong to the resident and to entrance balconies of covered galleries.

The term irrespective of building is used in order to show that the requirement of demand controlled outdoor lighting applies to small houses, apartment buildings, pre-schools and schools.

In the revision, requirement P4 concerning pre-school buildings has been changed from a point requirement to an obligatory requirement and includes both indoor and outdoor lighting at schools and pre-schools. This has been combined with the sub-requirement of automatic demand control for homes (previously O5), and now constitutes a combined requirement for demand control of lighting. For homes the requirement has been expanded with automatic control of lighting in general areas such as entrance halls, storerooms, basements, etc. However, lighting in lifts and emergency lighting does not have to be demand controlled.

There are several different ways to manage and control lighting in order to achieve energy-efficient lighting, i.e. to control lighting according to demand. Various buildings and premises have different needs and therefore control of lighting can function in different ways. Movement detectors, acoustic detection or presence sensors will register any movement in the sensor's detection area. They are suitable for stairs, halls, base-

ments, entrance areas or outhouses. Outdoor lighting may have built-in dusk sensors that switch on the light when darkness begins to fall and switch it off when there is enough daylight for the outdoor lighting to be unnecessary. Combined presence sensors and light sensors are used when light is to switch on and off automatically when someone moves within the area, but also when there is daylight such as at a driveway or in a storage room with windows.

Demand control of **indoor lighting** generally functions well in both pre-schools and schools. Nordic Ecolabelling does not make requirements of the applicable lighting-up time. The designer and constructor of a building, together with the company, knows best whether presence sensors in WC rooms in a pre-school should have a longer lighting-up time (e.g. 15 minutes) so that the children are not frightened if the lights go off while they are using the toilets.

For safety and security reasons **outdoor lighting** at schools and pre-schools may need to be switched on during all of the dusky and dark times of the day. Another reason is that the school's premises are often also used in the evening for various organised activities, which requires outdoor schoolyard and entrance areas to be lighted up. Nordic Ecolabelling wishes to emphasise that the requirement of automatic demand control does not entail any conflict with these requirements. Automatic daylight management and energy-efficient lighting are a good combination to achieve well-lighted courtyards in the evening and at night. On the other hand, movement controlled outdoor lighting might perhaps not function well since the lighting is switched on too late, i.e. when the person is already in the dark area, which does not give a safe and secure outdoor environment.

A general requirement irrespective of the type of control is that it must be connected to the fixture and not only to/in the light source. The reason is that the required energy efficiency must be maintained over time, even if the light source is replaced.

Outdoor lighting comprises lighting installed on the Nordic Swan Ecolabelled building and on supplementary buildings such as sheds or carports that are included in the labelling. The requirement of outdoor lighting also concerns lighting of any shared courtyards for the residents and in the playground of a Nordic Swan Ecolabelled school or pre-school.

O6 Energy-efficient white goods

White goods installed in Nordic Swan Ecolabelled buildings must at least fulfil the energy class requirements in Table 1 below. White goods that are not subject to the EU's energy labelling directive (2010/30/EU) are exempt from the requirement.

The requirement applies to white goods purchased from 19 March 2021, when the energy label (EU) 2017/1369 enters into force. Energy Labeling Directive 2010/30 / EU applies to dryers and ovens.

Table 1. Energy class to be fulfilled

White goods consumer	Lowest permitted energy class according to the Energy Labeling Directive (2010/30 / EU)	Lowest permitted energy class according to the Energy Labeling Regulation (2017/1369/EU)
Washing machine		D
Fridge		E

Freezer		F
Combined Fridge and freezer		F
Tumble dryer	A++	
Dishwasher		E
Oven	A	
Combined washing machine and tumble dryer (combi-product)		E

For fridges in prefabricated mini kitchens/kitchenettes the requirement of minimum energy class E applies.

✉ For all white goods, description of type of white goods and related energy label/energy class in product specifications or similar.

Background

Consumer products

Selecting white goods in a high energy class is an important way of reducing energy consumption for the operation of a building (household electricity). The difference in energy efficiency between various energy classes varies for different product groups. Refrigerators and freezers, for example, have one scale and TVs have another. As a rule of thumb, a combined fridge/freezer in energy class A^{+++} uses 60% less electricity than equivalents in energy class A. Dishwashers and washing machines with an A^{+++}label use 30% less than energy class A. The actual energy use also depends on how energy efficiently the product is actually used. It is a challenge for environmental labelling to require a certain energy-efficiency class when the ecodesign and energy labelling directive may be adjusted during, in this case, the house criteria's period of validity. Nordic Ecolabelling has proactively chosen to set ambitious but also attainable requirements.

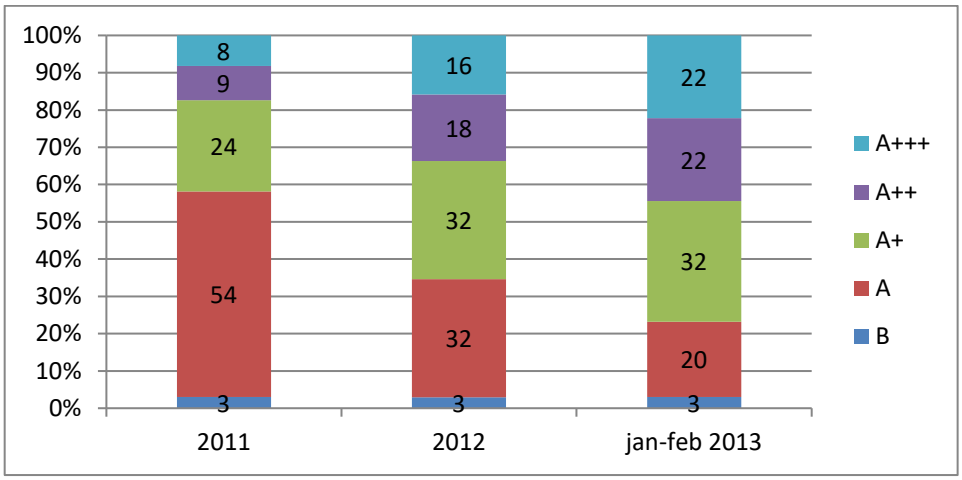
The requirement entails a tightening from previous requirements of at least energy class A^{+} for refrigerators, freezers and washing machines, and at least class A for tumble dryers and dishwashers. For ovens the requirement level is already class A, and the requirement also includes extractor hoods.

Energy labelling of refrigerators, freezers, washing machines and dishwashers has existed since the mid-1990s and has made these products more and more efficient. The energy labelling scale generally runs from G to A from the start, with a colour scale of red to green, where green is the most energy efficient choice. For refrigerators, freezers, washing machines and dishwashers, as well as tumble dryers, energy labelling hit the ceiling so that virtually all products were gathered at the top of the scale and the consumer no longer received any guidance. Therefore, three new energy classes were introduced: A^{+}, A^{++} and A^{+++} in the new 2010 energy labelling directive. A^{+++} is thus currently the most efficient class.

The following market data is taken from the report entitled "Omnibus Review Study on Cold Appliances, Washing Machines. Dishwashers, Washer-Driers, Lighting, Set-up Boxes and Pumps"[30] from March 2014.

[30] Van Holseijn en Kemna B.V; Vlaamse Instelling voor Technologisch Onderzoek; Viegand Maargøe A/S; Wuppertal Institut fűr Klima, Umwelt, Energie GmBH;"Omnibus" Review Study on Cold Appliances, Washing Machines. Dishwashers, Washer-Driers, Lighting, Set-up Boxes and Pumps, 12 March 2014.

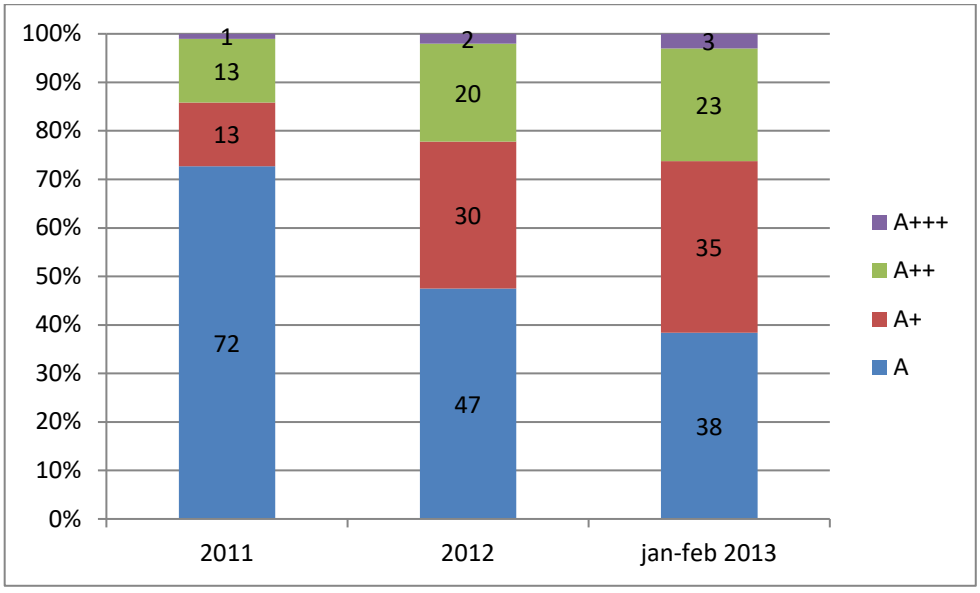
Table 1: Energy class distribution of washing machines sold (Source: GfK31 2013)



Market data from the European industry organisation CECED (the household appliance industry in Europe) shows that the proportion of washing machines in the market in the two best energy classes (A^{++} and A^{+++}) is as high as 54%, which is a higher figure than the combined 44% sold for products in the two best classes according to Table 1 above.

The Omnibus report also presents the status for combined washing machines and dryers, which are a very small product for households. In 2012, 35% of the products were in the best energy class (A). Market data (GfK for Sweden, Finland and Denmark) shows that almost 40% of all tumble dryers sold were in energy class A^{++}, i.e. the next-best energy class. Nordic Ecolabelling assesses that a requirement of class A for combi products and A^{++} for tumble dryers is reasonable.

Table 2: Distribution by energy class of dishwashers sold, 2011–2013 (Source: GfK 2013)



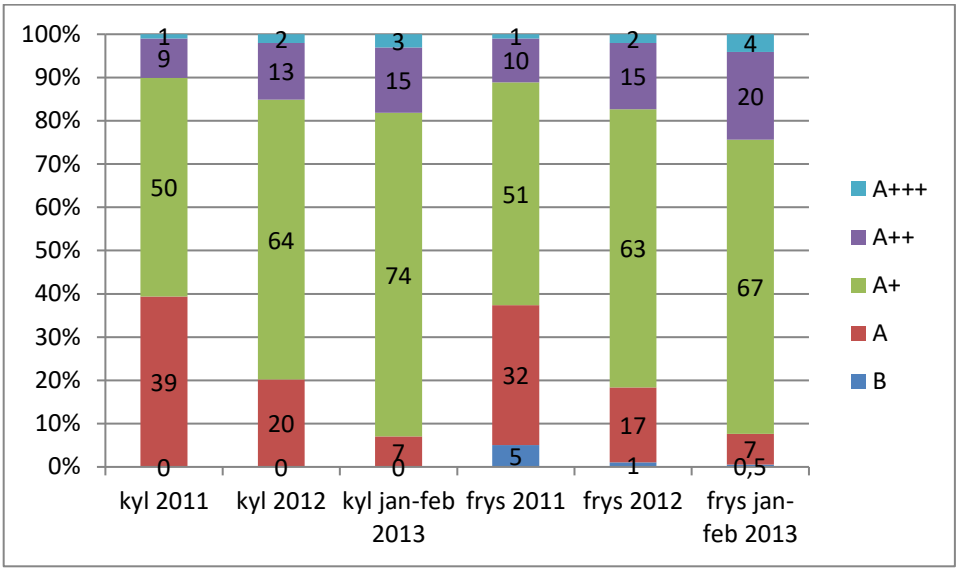
The picture is different for dishwashers (see Table 2 above). The sales statistics show that the share of products in the very best energy class is only 3% and that the development in recent years has been very weak. Information from the European industry organisation CECED shows that the share of products in the market in class A^{+++} is approximately

[31] Gesellschaft für Konsumforschung. Germany's largest market survey institute.

6%. However, products in the two best energy classes are together equivalent to 26% of the products sold at the beginning of 2013. 30-45% of dishwashers in the Swedish market were in energy class A^{++} or A^{+++} in 2014. In summary, Nordic Ecolabelling requires that dishwashers must be in energy class A^{+} or higher.

For refrigerators and freezers, products in the best class (A^{+++}) also represent a very small share of the number of refrigerators and freezers sold, see Table 3 below.

Table 3: Distribution by energy class of refrigerators and freezers in 23 EU member states, Luxembourg, Malta, Cyprus and Bulgaria are not included



One reason that this has increased between A^{++} and A^{+++} generally concerns energy efficiency. In summary, the two best energy classes represent almost 20% of the number of refrigerators sold in 2013 and almost 25% of the number of freezers sold in the same year. Therefore the requirement of energy class A^{++} or better for refrigerators and freezers in Nordic Swan Ecolabelled buildings is assessed to be reasonable. Approximately 30-40% of refrigerators and freezers in the Swedish market belong to energy class A^{++} or A^{+++}, based on information from search engines such as Prisjakt and Pricerunner.

Wine coolers are generally in a rather poorer energy class than ordinary refrigerators. Wine coolers are not a standard product in Nordic Swan Ecolabelled buildings, but there have been individual products where wine coolers have been installed in homes. Nordic Ecolabelling assesses energy class A to be reasonable for wine coolers.

On 20 June 2018 a specific energy class for mini kitchens/kitchenettes was added to the requirement. A mini kitchen can be installed in mini apartments/studios, in common areas or in rooms in residental buildings for the elderly. The most energy efficient fridges in such prefabricated mini kitchens at the moment, are labelled energy class A+ , which is also the minimum requirement put by the Nordic Ecolabel.

Energy labelling of ovens includes ovens, built-in ovens and the oven sections of cookers. The actual hob or stove is not included in the energy class and stoves do not have their own energy label either. 1 January 2015 the labelling of ovens has been expanded with the three classes A^{+}, A^{++} and A^{+++}. Both electrical and gas ovens are

included. Microwave ovens are not labelled as they are already energy-efficient products for the heating and preparation of food for 2-3 people.

As from 1 January 2015, extractor hoods must also be energy labelled. Energy labelling of extractor hoods ranges from A to G. In 2016 the requirement will be tightened and class A^+ will be added, while the poorest class G will lapse. In view of the range offered in the market and that version 3 of the criteria does not enter into force until year-end 2015/2016 Nordic Ecolabelling assesses that it is reasonable to require energy class A for ovens and B for extractor hoods. Even though the energy labelling requirement concerns extractor fans it is naturally okay to install carbon filter fans that do nor affect inflows and outflows for a Nordic Swan Ecolabelled building. For apartment buildings higher than three storeys, the pressure drop can be so great that a shared, low-energy ventilation system is preferable to energy-labelled consumer extractor fans. These kind of ventilation system (non-motorized hoods) are not covered by the energy labelling directive.

On 13 June 2018, it was decided to withdraw the whole product categroy extractor hoods from the requirement. This is due to that the present energy labelling directive for extractor hoods pose a great risk of increasing the energy use of the building, hence impairing the energy balance of the building. To gain energy class A or B the producers of motorized extractor hoods, have increased the flow leading to a a greater energy use of the building due to larger amounts of heated air beeing extracted.

Professional products
As a basic principle, the EU is preparing energy labelling requirements for consumer products. For refrigerators and freezers an exception has been made and it has been decided to introduce energy labelling for professional refrigerators and freezers. The proposal that has been drawn up, concerns refrigerators, freezers and combined refrigerators and freezers and the classes range from A to G to start with, after which classes A^+, A^{++} and A^{+++} will be introduced gradually. The proposed date for the entry into force of energy labelling of this product group is 1 July 2016.

The proposal on an energy labelling scheme for professional refrigerators and freezers for professional use are still not available. Nordic Ecolabelling is therefore not introducing a minimum requirement of energy class for refrigerators and freezers for professional use.

Washing machines and tumble dryers for professional use in a combined laundry room are not included since they fall outside the European regulations for energy classification and energy labelling.

The EU has updated its energy requirements for products and introduced a new energy labeling, Energy Labeling Regulation (EU) 2017/1369, which will replace the Energy Labeling Directive 2010/30 / EC. The scale in from A +++ to G is thus replaced by a scale in from A to G. In a transitional phase between the two energy labeling schemes, the two scales will exist simultaneously for the implementation to go smoothly and step by step. The requirement therefore reflects two types of energy labeling. From 19 March, the new Energy Label Regulation (EU) 2010/30 will apply, with the exception of stoves and dryers. Unfortunately, Nordic Ecolabelling does not have enough information about the energy labeling of wine coolers at present to be able to set a requirement. It is therefore not possible to get points for wine coolers in P4.

Exemptions
Products that are not covered by the energy labelling regulation are also not covered by the Nordic Ecolabelling requirements of energy-efficient white goods. This applies regardless of whether they are intended for consumer or professional use. In the respective regulation (see the Table in requirement O6) for the product group, it can be read which types of products are included and which of them are exempted.

5.5 Removed requirements on resource efficiency

In the revision a number of requirements on energy and resource efficiency have been removed as their environmental impact are low. A couple of obligatory requirements have med re-worked to point-score requirements and a couple of new point-score requirements have been introduced to emphasize resource efficiency. The removed or re-worked requirements are described below, and the point-score requirements are described in chapter 5.10 Point-score requirements.

Individual heat metering - requirement removed

In version 2.0 of the criteria, Nordic Ecolabelling introduced a requirement for individual energy metering. The requirement for individual energy metering was based on how it is environmentally relevant to measure and bill energy consumption per flat/residential unit, in order to give the user an incentive to reduce his or her energy consumption.

The requirement for individual energy metering in version 3 of the criteria has been changed as follows:

- The obligatory requirement for individual metering of heating and domestic hot water has been removed.
- Individual metering of domestic hot water is a point requirement instead (see also point requirements).
- The requirement of individual metering and billing of electricity is removed as a requirement, and instead incorporated in requirement O1 since Nordic Swan Ecolabelled buildings must by definition have individual metering of household electricity. This is also already normally the case today.

The motivation for change is the potential to save energy, the costs of installing individual metering systems (which the industry has promoted over several years), who should have the economic incentives, and the reliability of the metering methods. Looking forward in time, this change appears even more reasonable. In contrast to individual metering of domestic hot water and household electricity, individual metering of heating in a highly energy-efficient building will not be relevant, due to the very low heating requirement.

The EU Directive on energy efficiency (2012/27/EU) is the basis for the individual metering requirements (IMD). Each member state is implementing the Directive's targets in its own legislation. Finland has requirements for IMD of domestic hot water. Denmark already has a legislative requirement concerning IMD of heating energy and domestic hot water in new production. Norway, on the other hand, has no obligatory requirements concerning individual measurement. In Sweden, this issue is being investigated by the government.

At month-end October/November 2014 the Swedish National Board of Housing, Building and Planning presented a report[32] which showed, however, that in some cases individual metering of heating, domestic hot water and cooling is not cost-effective in either new production or conversions. The report e.g. summarises that a reduction of indoor temperatures through heating based on district heating by up to two degrees would give a saving of maximum SEK 20/month and flat. The economic incentive for residents to lower indoor temperatures, which is the aim of the requirement, is thus very weak.

An important argument against individual heat metering is that when residents have to pay for heat energy there is an obvious risk of reducing the client and property owner's incentive to build more energy efficiently. The same applies to energy optimisation measures such as replacing windowpanes and supplementary insulation. The reason is that it is not the property owner that will save money from reducing the energy consumption. Residents only have limited opportunity to save heat energy by changing their behaviour. These conclusions are the justification for removing the obligatory requirement for individual heat metering.

Fixed light sources - requirement removed

The requirement of fixed light sources (O5) in version 2 has been removed after the consultation. The primary reason is that the requirement does not make any particularly great difference. The lighting sector has undergone very considerable development in recent years. Filament bulbs have been phased out completely and the lamps available in the market are more or less energy efficient. LED lighting is more or less the standard today. There is ongoing technical development, and an ambitious lighting requirement might risk being ineffective within the criteria's term of validity.

Low-flush toilets - requirement removed

The requirement for low-flush toilets/dual-flush toilets (O31) in version 2 has been removed as this must be regarded as practice in new manufacturing. Nordic Ecolabelling assesses there to be a very low risk that a non-dual-flush toilet might be installed in a Nordic Swan Ecolabelled building for which ongoing adjustments have been made for sound environmental and indoor environment performance through the fulfilment of a large number of requirements.

Reduced energy consumption - point requirements removed

Version 2 of the criteria gave the opportunity to win points if the building's energy performance exceeded the obligatory level (75% of the legislative level). As the energy requirements in the building regulations are tightened, the scope to be even more energy efficient is narrowing. In other words, there is limited potential. Nordic Ecolabelling's viewpoint is that the obligatory energy requirement (O4) gives a Nordic Swan Ecolabelled building with good energy performance and that a point requirement would thus add very little value. The relevance of a point requirement is thus more limited than in version 2 of the criteria. As previously stated, different Nordic countries have different energy regulations, so that a general point list might not be fair.

On this basis, Nordic Ecolabelling has removed the point requirement for reduced energy consumption (P1) and instead given priority to other energy-related point requirements. Among other things, mote points can be given for energy produced by a

[32] Individual metering and billing for new buildings and conversions. Report, 2014:29. Swedish National Board of Housing, Building and Planning.

local, renewable energy source, for example solar energy. Two new point requirements have also been introduced that promote lower energy consumption from material production phase.

Sanitary fixtures

The requirement on sanitary fixtures is changed to a point-score requirement, se P5.

5.5.1 Waste

O7 Possibility of sorting at source

Sorting vessels with the possibility of sorting at source into at least:

- Four fractions to be installed in the Nordic Swan Ecolabelled residential unit, i.e. in flats and small houses;
- Five fractions to be installed in or adjacent to the kitchen of the Nordic Swan Ecolabelled school and pre-school.

Residual waste is considered one fraction.

Waste disposal units/waste disposer are only deemed to be a fraction, provided that the food waste that is disposed of is degraded or composted and that the disposal unit installed is approved in accordance with municipal/local sewerage regulations.

Requirement O23 (nano) also applies to waste disposal units.

✉ Description of vessels for waste sorting at source, in text or in picture.

Background

That the Nordic Swan Ecolabelled flat or small house is already equipped on occupation with vessels for sorting at source is important in order to support waste handling, material recovery and thereby a reduced environmental impact from the household. On the other hand, Nordic Ecolabelling does set requirements concerning which fractions must be sorted, due to variations in countries' and municipalities' collection systems.

Compared to version 2 of the criteria, the requirement has been tightened slightly. Now four fractions are required, compared to the previous three. It is specified that residual waste/residual fraction also counts as a fraction. For pre-schools and schools where large quantities of waste and material are handled at the same place, it is reasonable to require five fractions.

Where large amounts of food waste are produced, such as in school kitchens, a waste disposal unit can give environmental benefit as well as financial advantages. The working environment can be improved for the company's staff as well as people that handle waste, since heavy lifts are reduced. A waste disposal unit finely shreds the food waste, which is then collected in a tank that is emptied by a sewage collection vehicle. The requirement has been specified to the effect that waste disposal units are deemed to be a fraction, but only provided that the food waste that is disposed of is degraded or composted and that the waste disposal unit installed is approved in accordance with municipal/local sewerage regulations.

O8 Waste sorting station

In connection with pre-school and school buildings, as well as buildings with more than eight flats, there must be a waste sorting station with room for at least six waste fractions, for the sorting of e.g.:

- Paper
- Coloured and clear glass

- Plastic
- Metal
- Electronic waste
- Cardboard packaging
- Corrugated board
- Organic waste for degradation or composting

✉ Description of the types and numbers of fractions and distance from the waste sorting station to the Nordic Swan Ecolabelled building.

Background

It is important that Nordic Swan Ecolabelled buildings offer good opportunities for sorting of waste at source close to the property in question. Nordic Ecolabelling therefore sets the requirement of completed areas or separate buildings for waste sorting vessels with at least six fractions. The requirement is assessed to be at a suitable level and has not been changed. In conjunction with licensing, the term "in connection with" has been discussed. This wording must be interpreted to mean that the waste sorting station does not need to be in the building or on the same site, but it must be dimensioned to meet the need from the Nordic Swan Ecolabelled building. If there is already a waste sorting station close to the Nordic Swan Ecolabelled building, it can be used.

The relevant municipality's guidelines can be used as a guideline for the distance. If there are no guidelines, the following distance[33] can give a picture of what is appropriate to ensure that sorting at source is not found to be too complicated:

- Household waste: 50 m
- Newspapers and packaging: 100 m
- Coarse waste, batteries and electrical waste: 200 m

5.6 Indoor environment

Introduction

Since in today's modern society people spend most of their time indoors, indoor environment factors have a great impact on people's health and well-being. Buildings must therefore be planned and constructed in order to achieve a healthy, secure and pleasant indoor environment.

A poor indoor environment as a consequence of problems with the quality of the indoor air can not only lead to health problems, but also reduced productivity and financial losses. According to KOMIN, the cross-disciplinary competence centre for indoor environment and health, the costs of a poor indoor environment in Finland alone are calculated at a breathtaking EUR 3 billion per year[34]. The quality of the air we breathe is very important to our health, making it important that we live and act in fresh buildings with fresh air. Research shows that inflammation of the bronchial mucous membranes (chronic rhinitis with such symptoms as chronic sniffling, a bunged-up nose and difficulty sleeping) is related to the indoor environment. Factors such as ventilation,

[33] The distances are guidelines set by the City of Stockholm.
[34] www.kominmiljo.eu/byggnadstart

cleaning level, air humidity, mould and airborne particles from construction materials such as formaldehyde affect the occurrence of chronic rhinitis[35].

A large number of aspects influence a good indoor environment and good health. Nordic Ecolabelling has assessed the following as the most important areas for obligatory requirements:

- Radon
- Moisture protected construction
- Ventilation
- Formaldehyde
- Sound/noise
- Daylight
- Use of chemicals (in chemical products and construction materials) to minimise the risk of primary emissions. See separate chapter 5.6.

The criteria also include point requirements for the indoor environment area. See also the point requirements at the end.

O9 Radon

Radon prevention measures shall be undertaken to ensure adherence to national official requirements and limits on radon levels in buildings. The building shall either be constructed radon proof or be built with a lower degree of radon prevention measures, provided that the risk analysis of the presence of radon (both from the ground and from filling materials) supports this.

☒ Description of (any) radon prevention measures undertaken in the building.

☒ If the building is not built radon proof, a risk analysis/assessment shall be conducted, showing the risks of the presence of radon from both the ground and filling materials supporting the level of radon prevention measures. Result from geotechnical surveys shall form the basis for the risk analysis.

Background

The purpose of the requirement is to ensure a very low radon content in a Nordic Swan Ecolabelled building via preventive work, to guarantee adherence to national official limits.

The requirement is made clearer but is in practice, not changed relative version 2. The requirement focuses on the preventive actions as a guarantee for compliance with the national limits (often with a great marginal). Nordic Ecolabelling has evaluated that it is not feasible to in addition require a radon measurement as a final documentation on the preventive work. Thus, the requirement does not consist of a specific limit (as was tried in the hearing process) but refer to national limits for radon, see Table 4. It is well-known that radon measurement is subject to uncertainty and has relatively high error margins, and it is therefore recommended to perform measurement during the winter. As there are various local conditions and many different technical building methods to ensure low radon levels, the individual construction projects must describe the measures that will be taken during the construction process.

[35] Allergi i Praxis, Tidsskrifte fra Norge astma og allergiforbund, Temanummer Innemiljö (Allergy in Practice, Periodical of the Norwegian Asthma and Allergy Association, Special edition on the indoor environment), no. 4, 2012.

Radon is chemically inert, naturally occurring radioactive (inert) gas. It does not smell, is colourless and is formed naturally as the radioactive degradation of the uranium in rocks and the soil/land. The gas is found in very low concentrations outdoors but can accumulate indoors when air from the ground penetrates through the ground or basement. Radon can also be added via drinking water (primarily in drilled wells). Globally, radon is the second-largest reason for lung cancer after smoking.

Norway is one of the countries in the world with the highest radon concentrations in the indoor air. This is due to several factors, including special geological conditions with alum shale, uranium-rich granite and moraine, large temperature differences between the outdoor and indoor air, especially in winter, which contributes to an increased inflow of radon from the ground, as well as negligence in observing the requirement for e.g. radon barriers in new production. Radon concentrations in Norwegian homes have increased in the last 20-30 years and are usually highest in newer homes.

According to an overview article in the Journal of the Norwegian Medical Association[36] the research conclusion is that radon in the home gives a small increase in the cancer risk for both smokers and non-smokers, and that around 2% of all cases of cancer in Europe are due to this increased risk. The highest increase is observed among smokers, because radon and smoke have a synergetic effect. This shows how it is still important to control the amount of radon coming into the indoor air in buildings. Since the increased risk is proportional to the radon exposure without a lower threshold value and it is easy to take steps to reduce radon levels in buildings, it is relevant for Nordic Ecolabelling to continue to set radon requirements. Appendix 6 describes several of the methods recommended by the Nordic authorities.

Table 4: The official threshold values for radon in buildings in the Nordic countries

	Denmark	**Norway**	**Sweden**	**Finland**
Maximum threshold value	100 Bq/m^3	200 Bq/m^3	200 Bq/m^3	200 Bq/m^3
Action limit		100 Bq/m^3		
Other		Levels that are as low as possible*		

** Measures may also be relevant below the action level at which it is considered possible to achieve a significant reduction of the levels by taking action. For new construction, the technical building regulations make requirements of preventive radon measures and threshold values.*

On 14 December 2017, the National Criteria Management Group decided to clarify the radon requirement, without changing the tightness of the requirement. Thus, the requirement aims to ensure that national threshold limits are fulfilled, there is no need to conduct a risk assessment if the building is constructed radon proof, which corresponds to the highest levels of prevention.

O10 Moisture prevention

In order to minimise the risk of harmful damp and moisture in Nordic Swan Ecolabelled buildings, and to ensure a good and healthy indoor environment, there must be a plan or a description for moisture prevention work that at least includes:

[36] Å Helland and O T Brustugun: Lungekreft hos røykere og aldri-røykere, Tidsskriftet for Den norske legeforeningen (Lung cancer in smokers and non-smokers, Journal of the Norwegian Medical Association), 2009; 129:1859 – 62. http://tidsskriftet.no/article/1893600#reference-11 (Downloaded 10.01.29015).

a) selection of damp sensitive materials and technology; relevant for the origin of harmful moisture

b) weather protection and other handling of materials and building/construction elements at the construction site

c) measures taken to ensure that the building dries out sufficiently and statement of the time this is estimated to take

d) determination of the highest permitted moisture status of various materials (critical moisture state)

e) control of moisture protection by calculating or measuring the moisture in concrete. National guidelines must be followed. If measures are conducted, borehole measurements must be undertaken as surface moisture measurement is not sufficient to determine whether the concrete slab is dry enough.

In addition, a competent moisture expert technician must be nominated to monitor adherence to the moisture prevention plan.

If subcontractors are hired for work that affects moisture protection, the licence applicant must ensure that subcontractors either adhere to the licence applicant's routines or have their own routines to ensure that moisture problems are minimised.

The competent moisture expert technician must have documented knowledge and experience in building techniques, have knowledge of moisture in materials and constructions and the consequences. In addition, the expert technician must have at least 2 years' experience in moisture prevention work or moisture damage assessment work and at least 2 years' experience from working in building projects, projecting and/or the management of buildings.

☒ The moisture protection plan, or equivalent document, with routines to show how items a) to e) are fulfilled. If subcontractors used for work that affects moisture protection have their own routines, these must also be reported.

☒ Statement of the competent moisture expert technician with a description of competence and experience.

Background

Moisture in buildings increases the risk of respiratory infections and illness such as asthma, bronchitis, chronic bronchitis and respiratory irritation by 50%. The costs of increased illness and reduced health are considerable, but society's economic losses from reduced learning and lower productivity are even higher[37]. One third of Sweden's buildings has moisture or mould damage, with problems seen most frequently for small houses. The building elements most often subject to moisture damage are windows, building foundations and wet rooms.

Exposure of construction materials to moisture can lead to increased emissions of volatile chemical substances. The degradation is usually due to moisture damage in concrete beams since, besides moisture, the chemical reaction also needs alkaline conditions. To avoid degradation, the concrete slabs must be sufficiently dry before further installation of the surface layer. On determining how dry the surface should be, account must be taken of the most moisture-sensitive material in the structure. Surface moisture measurement is not sufficient to determine whether the concrete slab is dry enough, but borehole measurements should be performed. As a voluntary Nordic labelling system, Nordic Ecolabelling must determine requirements that are challenging, but also reasonable for the best in the industry to achieve. Based on the Nordic countries' building regulations, experience from the requirement in version 2 of the criteria, and the importance of moisture protection to a good and healthy indoor

[37] Fukt i bygninger-hva koster det? (Moisture in buildings - what does it cost?); Bakke, J.W, Norwegian Labour Inspection Authority, Allergi i Praxis (Allergy in Practice), n4 2012.

environment, the requirement has been revised and supplemented with the designation of a competent moisture expert. This is a person with special competence and experience within moisture protection, with the role of following up on the achievement of the moisture protection plan.

The moisture expert technician must have documented knowledge and experience in the following areas:

- Building techniques
- Knowledge of moisture in materials and constructions and the consequences
- At least 2 years' experience in moisture prevention work or moisture damage assessment work
- At least 2 years' experience from working in building projects, projecting and/or the management of buildings.

Nordic Ecolabelling does not require diplomas or any type of third-party verification of the competence of the moisture expert. However, is a diploma for example according to "Diplomerad Fuktsakkunnig" a way of verifying competence according to the requirement.

The Nordic countries' requirements and advice to minimise the risk of moisture in buildings are summarised in Appendix 7. The regulations and recommendations have certain elements in common, while others are different. Besides the national building regulations, there are guidelines as a help to interpret the authorities' requirements. In Sweden, there is the ByggaF industry standard, drawn up by the Moisture Centre at the Faculty of Engineering, Lund University.[38]

O11 Ventilation

Ventilation systems in Nordic Swan Ecolabelled buildings must be function-controlled before the system is taken into use for the first time. The control must include:

- that the ventilation system does not contain pollutants that might be spread in the building
- that instructions and maintenance instructions are easily accessible
- that the ventilation system otherwise functions as intended and
- that the function and characteristics of the ventilation system are in accordance with the current regulations.

Function control must be performed for each small house and pre-school and school building. For apartment buildings and extensions to apartment buildings, this must be performed for a representative selection that constitutes at least 10% of the total number of flats, but always at least one flat.

Automatic controls for demand management of air volume/ventilation must be installed in pre-school and school buildings.

In Sweden, the obligatory ventilation control (OVK) is a fully valid function control. The result of the first OVK inspection can be used for verification.

✉ Protocol from the function control of ventilation performed showing the result and stating the number of buildings and the proportion of flats in an apartment building.

✉ Description of the type of demand-controlled ventilation.

[38] http://www.fuktcentrum.lth.se/verktyg-och-hjaelpmedel/byggregler/

Background

The ventilation requirement in version 2 entailed that national rules for air quality and level of pollution in outdoor air had to be fulfilled. It is still relevant to set a requirement for ventilation since air quality is an important aspect of the indoor environment. On the other hand, Nordic Ecolabelling should not set requirements that are equivalent to legislation. The requirement is changed and now focuses on the ventilation system undergoing function control before commissioning (i.e. before occupation or the building is taken into use). The aim is to ensure a good indoor environment with good air quality, and to avoid excessive energy consumption.

The requirement is inspired by the obligatory ventilation control (OVK) which has been a requirement in Swedish building regulations since1991. Since Nordic Ecolabelling does not control the operational phase the requirement concerns the first OVK inspection performed. Since equivalent requirements of obligatory ventilation control are not found in all Nordic countries, Nordic Ecolabelling does not require ventilation control to be undertaken by certified experts. When this is a statutory requirement (as is the case in Sweden), this takes place indirectly via the Swedish National Board of Housing, Building and Planning's regulations' requirement for a certified person to perform OVK.

The sub-requirement directed at pre-schools and schools is unchanged from version 2. The sub-requirement entails that there must be demand-controlled ventilation in the type of premises where there is great variation between presence/absence and below low/high load. In demand-managed ventilation, a room or premises are ventilated as much as is needed, which entails energy optimisation opportunities.

O12 Noise environment (solely applies to pre-school and school buildings)

Sweden: Buildings must fulfil noise class B for all parameters assessed according to the valid national standard.

Denmark and Finland: Reverberation and one additional parameter must fulfil noise class B. All other parameters shall fulfil noise class C.

Norway: Schools - Sound class C for reverberation time. Preschools - Sound Class B and another optional sound environment parameter. Other sound environment parameters must comply with class C.

Rooms that are occupied temporarily are exempt from the requirement.

National noise standards must be used in Norway, Sweden and Finland. For Denmark, reference is made to Trafik og Byggestyrelsens vejledning om lydbestemmelser (Akustisk Indeklima).

Examples of rooms that are occupied temporarily are corridors, entrance halls, photocopying rooms, changing rooms and WCs.

National noise standards: Sweden SS 25268, Norway NS 8175, Finland SFS 5907.

For safety reasons, an entire department is viewed as one room for the airborne sound insulation parameter.

✉ Planning/projecting of noise environment with the statement of the noise class achieved for all parameters in assessed rooms. The planning/projecting must be performed by an acoustic technician or another person with equivalent competence.

Background

Poor acoustics in a room give a high noise level and a poor learning environment. Concentration, understanding of speech, memory capacity and ability to understand are all negatively affected. If acoustics are poor, the teacher has to strain his or her voice

more. A strained voice will not have the same dynamic and content as a normal voice and will be more difficult to listen to.

For pre-schools and schools/premises too, noise is divided into four noise classes, with C equivalent to the statutory level. Noise class B is thus equivalent to one class better. The Swedish SS 25268 standard comprises five main parameters: airborne noise insulation, impact noise level, room acoustics, noise pressure level indoors from installations (called installation noise) and noise insulation from external sources. The Norwegian NS 8175 standard comprises airborne noise insulation, impact noise insulation, noise level/sound level and the room's acoustic parameters. For Denmark reference is made to the Trafik og Byggestyrelsens vejledning om lydbestemmelser (Akustisk Indeklima).

The requirement in version 2 of the criteria pointed out two types of premises/rooms where a good noise level must be achieved: living rooms and quiet rooms. This is not relevant and is not optimum either. Rooms are often used for several different purposes and activities are also moved around between rooms. Rest, for example, may take place in more rooms than those that are earmarked as quiet rooms in a pre-school. This revision ensures that a good noise environment is achieved in most of the pre-school buildings or school buildings. The requirement is expanded/tightened to state that at least noise class B according to national standards or the equivalent must be fulfilled in all rooms/premises where people stay more than temporarily. This e.g. includes classrooms, working rooms, playrooms, family rooms, wet playrooms, ateliers, canteens and rooms for quiet and sleep. For safety reasons, an entire department is viewed as one room for the airborne sound insulation parameter. The reason is that staff must be able to hear sound from children in other rooms.

Noise class B for pre-schools and schools is, exactly as for homes, a noise class better than required according to legislation, and may therefore be cost-driven. It is also relevant to ensure a good noise environment in a Nordic Swan Ecolabelled building and something that licensing has shown to be possible to achieve.

We make an exception for noise class B requirements for rooms in which people stay temporarily even though these types of rooms have less strict limits in the standards for noise environment classification of buildings. Examples of such room are corridors, entrance halls, photocopying rooms, changing rooms, sports halls and WCs.

The requirement is verified with project design of sound environments where the intended sound class must be stated in the report/document. As a control that the outcome corresponds to the project design, the administrator can request to review the sound environment report as part of the contractor's self-monitoring.

The requirement was adjusted in autumn 2016. The reason is that sound class B in the various standards in the Nordic region is not completely comparable. This has already been taken into consideration in the point requirement for the sound environment in homes (P8), but not in the obligatory requirement for nursery schools and schools.

A comparison between licence processing shows that the noise from technical installations in the Norwegian standard class B, is 25/27 dB for communal areas in a nursery school and 30/32 dB for sound class C. The mean sound level from installations according to the Swedish SS 25268 standard (sound class B) is 35/55 dB for playrooms, office rooms, staff rooms and meeting rooms, and 30/45 for teaching rooms and resting rooms in nursery schools.

In summary, it is assessed that Nordic Ecolabelling must set an ambitious requirement for the sound level in buildings for schools and nursery schools. The requirement must be differentiated between Sweden and the rest of the Nordic region, due to the aforementioned differences in size and threshold values in the sound standards. The sound environment parameter sound acoustics/reverberation time is assessed to be especially important in schools and nursery schools and must therefore also fulfil sound class B in Norway, Denmark and Finland. In addition, an optional sound environment parameter subject to the standard/national guide must fulfil sound class B. Other parameters must comply with the statutory level, i.e. class C.

In addition, the reference for Denmark is adjusted from BR to the Danish Transport and Construction Agency's guide concerning sound regulations (Acoustic indoor climate).

In DK there are national regulations without sound classes for daycare institutions and schools. This was also clear in generation 2 of the criterion but is not quite clear in generation 3.

During the spring of 2019, requirements were valued and compared between the Nordic countries. The result shows that for Norway's part, the requirement for reverberation time in schools is set at a more stringent limit, hence a national adjustment is made

O13 Daylight

In pre-schools* and schools, all common rooms/playrooms, and classrooms are to have either an Average Daylight Factor (DFavarage) ≥ 2.5% or a Daylight Provision of at least 300 lux (over 50% of daylit hours and minimum 50% of the area of the rooms assessed).

In single-unit houses, row houses and apartment buildings, the National building code requirement for Daylight Factor (DF) or Daylight Provision must be fulfilled in at least one occupiable room per residential unit. If an applicable threshold for either Daylight Factor or Daylight Provision is not stated in the relevant country's building code, compliance can be demonstrated by using the requirement from another Nordic country of choice.

If the Daylight Factor exceeds 5.0% in any rooms in the Nordic Swan Ecolabelled building, the licensee must use calculations or equivalent to verify that the official requirements of the summer indoor temperature are fulfilled. See Appendix 5.

If the pre-school has more than one department, at least one common room per department must fulfil the requirement.

A single-unit house and a flat are considered to be a residential unit. Corridors, hallways, storages, bathrooms and similar are not considered as occupiable room.

A computer program must be used to calculate daylight. See Appendix 5 for calculation variables and methodology. Simplified methods based on window to floor area even with correction factors, (for example fönsterarea-metoden eller 10 %-regeln) are not accepted as a means of compliance.

For apartment buildings, calculation results need only be submitted for a selection of 10 apartments (1 room per apartment). The selection should best support the argument that all apartments in the building have at least one room which meets the daylight criteria. If the number of apartment is less than 10, a calculation for all apartments (1 room per apartment) shall be submitted.

** In pre-schools situated on the ground floor in apartment buildings where the daylight is restricted by the surrounding, common rooms/playrooms may fulfil the Daylight Factor and/or the Daylight Provision requirement in the relevant country's building code.*

✉ Calculation results showing the Daylight Factor and/or the Daylight Provision for each of the assessed rooms, with the function of each of the rooms stated. The submitted evidence must include all items listed under "Reporting requirements" in Appendix 5.

Background

Why does Nordic Ecolabelling set daylight as a requirement?

Access to daylight must be balanced with concern for summer indoor climate and energy use, urban density and sometimes also the airtightness of the building envelope. Nordic Ecolabelling sets requirements for daylight in order to ensure that Nordic Swan Ecolabelled buildings provide a good indoor environment for the people that use them.

Nordic Ecolabelling's daylight requirements entail that when the building site is chosen and the project designed that the licensee must already be aware of the balance between the building's orientation, glass areas, window location, connection and combination of the window panes' light transmission, U-value, g value, floor area, colour scheme and surrounding obstructions.

In version 2 of the criteria the daylight requirement solely concerned pre-school buildings with the requirement of an average daylight factor of >4% in all playrooms and common rooms, while the minimum point daylight factor had to be >1%. This is a very strict requirement and the revision has focused on formulating a requirement that not only gives good daylight, but that can also be reasonably achieved in harmony with the building´s function. We hope that the revised requirement will serve as inspiration to build homes, pre-schools and schools with good daylight and to put focus on an important issue which, despite its presence in the building codes, does not always receive the attention it deserves.

The daylight requirement in criteria generation 3 is constructed as follows:

- For housing, Daylight Factor or Daylight Provision must meet or exceed requirements given in the relevant national building code for a minimum of one (1) occupiable room per apartment/dwelling. The term occupiable room concerns living rooms, family rooms, kitchens, bedrooms and similar in a dwelling. Corridors, halls, storage, bathrooms and similar are not considered occupiable rooms. Currently the following criteria apply in the building code of the Nordic countries:

  Sweden: Daylight Factor minimum 1% at half room's depth

  Denmark: Daylight Provision minimum 300 lux 50% time and 50% of room's area

  Norway: Average Daylight Factor minimum 2%.

- Both pre-school and school buildings must fulfil the daylight requirement. The requirement of the Average Daylight Factor is set at minimum 2.5% for common rooms/playrooms, and classrooms. In the autumn 2016 an exemption was made for pre-schools situated on the ground floor in apartment buildings. See the end of this section.
- The requirement is also made that the Daylight Factor may not exceed a certain value. The reason is that excessive sunlight does not give more benefit/value, but risks causing excessive temperatures.
- Compliance is to be demonstrated with a daylight calculation of either Daylight Factor or Daylight Provision. Simplified methods comparing window to floor area are generally inaccurate and therefore not accepted as a means of compliance.

- The requirement allows for the labelling of standardised building designs by the introduction of an adjusted calculation method; see Appendix 5 of the criteria document.
- For apartment buildings, calculation results need only be submitted for 10 apartments (1 room per selected apartment). The selection should best support the argument that all apartments in the building have at least one room which meets the daylight criteria. See Appendix 5 of the criteria document.

Applicable legislation
Though all the Nordic countries have a requirement for daylight, the contents of their legislation differs enough that comparison of what each deems to be an acceptable daylight is difficult. Nordic Ecolabelling's daylight factor requirement hamonizes with the current regulatory minimums and as such, compliance with its criteria can be considered to be an indicator that local regulations for daylight have been met. Current legislation must always be viewed as a minimum requirement that must naturally be fulfilled even if this is not reviewed by Nordic Ecolabelling.

It is most appropriate to calculate daylight factor with computer simulations from early project design and throughout the process up to and including the construction docu¬ment stage. In order to verify fulfilment of the requirement, a calculation is sufficient. There are free computer programs for this purpose, of which the most well-established are Radiance, Velux Daylight Visualizer and Relux. Guidelines for performing daylight calculations given in appendix 5 of the criteria document are to be followed. Simplified calculations based on the relationship between window area to floor area lack accuracy and even though often acceptable for building code purposes, are not an acceptable means of demonstrating compliance. Rather, such methods should only be used as a rough indication of daylight levels early on in a project.

An internationally accepted way to assess daylight is with Average Daylight Factor (DF_{ave}) or DF_{median}. Assessment based on a single point is less common. However, because of national differences it is important that Nordic Ecolabelling recognizes each of the country's conventions regarding daylight factor. As a rough comparison, for simplified rooms, DF_{ave} of 2% is marginally stricter than 1% at half the room depth.

The allowable peak temperatures are governed by the Nordic countries' legislation via the authorities concerned. The formulation of as well as acceptable temperature levels may vary, but the objective is to minimise the number of hours in which the indoor temperature exceeds a certain value in the summer (often 26° or 27°C). Specific requirements for each of the Nordic countries can be found in each of the country's workplace regulations (for pre-schools and schools) and in their respective building and/or public health codes.

Daylight is good for the health
The daylight factor indicates the percentage of daylight available from outdoors that comes into a room given a heavily overcast sky. It is relevant to have a requirement that ensures appropriate levels of daylight- since daylight promotes health, creates a good indoor environment, and promotes general well-being. Research show that people need daylight to feel well and stay healthy. Since we spend 90% of our time indoors, daylight in buildings is important to our health. A large proportion of the Nordic region's population risk not getting enough daylight, with this potentially leading to disruption of

the 24-hour cycle and consequentially long-term health problems such as disturbed sleep, seasonal depression and diabetes[39].

A building with good daylight can help to minimise health risks. Nordic Ecolabelling wishes to inspire the construction of new buildings with well-placed windows of appropriate size and suitable shading from direct sunlight. Studies have also shown that daylight increases productivity[40] and also suggest that daylight improves student performance[41]. Good daylight also saves electrical energy that would otherwise be used for lighting.

Conflicting requirements
Many of the demands made of a building risk being in conflict with one another. Such is the case for daylight as a number of current market trends lead to reduced exposure to daylight. These trends include increasing urban densification, maximisation of leasable space and increased energy efficiency. These trends will intensify and continue for the foreseeable future. These factors are seldom isolated phenomena, but rather act together to challenge our access to daylight if not kept under control. Buildings are regularly being constructed (both homes and offices) in which a majority of the occupiable rooms do not fulfil the minimum statutory requirements concerning daylight. This issue also has an ethical aspect as the popular and more expensive flats located higher up in apartment buildings usually have better daylight than less expensive flats on floors further down in the same building.

Good daylight has many advantages, but **excessive** daylight does not. Too much daylight leads to problems with the indoor environment such as glare and excessively high temperatures. Solar energy heats up a room. Excessive heat, especially in the summer, is a strong contributor to excessive temperatures that lead to a less healthy indoor environment, and consequently a need for cooling thereby increasing energy consumption. It is clear that daylight and solar load need to be in balance.

Sometimes other problems can arise. For example, skylights need to be installed to meet the daylight targets. This can increase the risk of moisture damage. Skylights contribute daylight- but do not normally provide any view out and should therefore be used with caution.

Adjustments in criteria generation 3 In the autumn of 2016, an opportunity was introduced for a slightly lower requirement for pre-schools which are located on the bottom floor of a multi-storey building and where the surroundings (buildings and vegetation) limit daylight. The exemption is deliberately worded so that it is not the building in which the pre-school is located that can limit daylight, since the licence applicant can control this building and influence protruding balconies, etc. A detached pre-school (irrespective of surroundings buildings) is not given this easement. The argument for this is that pre-schools at ground floor level achieve better energy performance, due to a less enclosed area (the roof is an apartment floor). Equivalent detached pre-schools will have larger enclosed areas and thereby poorer energy

[39] Rogers, Paul; Tillberg, Max; Bialecka-Colin, Ewa et al., 2015, Vad innebär BBR *God tillgång till direkt dagsljus*? (Implications of BBR Good access to direct daylight?) -SBUF-report 12996.
[40] Figueiro, Rea, Stevens & Rea, 2002, Daylight and productivity-A possible link to circadian regulation. Light and Human Health EPRI/LRP 5th International Lighting Research Symposium, California.
[41] Heschong Mahone Group HMG, 1999, Daylighting in Schools. An Investigation into the Relationship Between Daylighting and Human Performance. For George Loisos, California.

performance. With regard to school buildings, no adjustments at all are made to the requirements.

In December 2017, clarifying amendments were made to the text concerning the requirement that the daylight factor must not exceed 5.0% in any habitable room, as this would entail a significant risk of them exceeding the maximum acceptable indoor temperature in the summer months. The text has been amended to make it clear that the rooms and the apartments which have the most daylight in the building must be inspected, and not "the brightest of the darkest apartments". No change has been made to the requirement with regard to the lowest permitted daylight factor.

An addition has been made to Appendix 5 stating that the DF_{median} can be accepted in rooms where it is complicated to establish the point at which the DF_{point} should be calculated.

In October 2020 the metric Daylight Provision was introduced parallel to Daylight Factor as means of verifying compliance with the requirement.

O14 Formaldehyde emissions

The requirement concerns all wood-based panels containing more than 3% by weight formaldehyde-based additives. Panels solely marketed as façade panels are exempted.

For wood-based panels that are either building panels (raw or surface treated), panels in floors, panels in doors* or fittings** as well as mouldings, baseboards and frames, the average emission of formaldehyde must not exceed 0.124 mg/ m^3 air for MDF panels*** and 0.07 mg/m^3 air for all other types of panel in accordance with the current version at the time of sampling of EN 717-1.

Laminated panels do not need to be tested for formaldehyde if a certificate can be provided to show that the level of free formaldehyde in glue with any hardener (i.e. the final glue compound) does not exceed 2,000 ppm (0.2% by weight).

If the panel has been tested with other test methods than EN 717-1(Chamber method) the limits can be verified according to any of the methods in table below or with a certificate according to the bullet list below the table.

For requirements on test methods, see Appendix 1.

Table 1. Nordic Ecolabelling's limits for emissions of formaldehyde with the use ofdifferent test methods.

Test method:	EN 717-1 (23°C/45% RH)	ISO 16000-9 (23°C/50 % RH). Testmethod for M1	ASTM E 1333 (23°C/50% RH)	JIS A 1460
MDF	0.124 mg/m^3	0.05 mg/m^2/h	0.07 mg/m^3	0.66 mg/l
Other panels	0.07 mg/m^3	0.03 mg/m^2/h	0.10 mg/m^3	0.53 mg/l

Nordic Ecolabelling accepts the following certificates as documentation for the requirement:

- E1-certificate for MDF-panels
- M1-certificate for MDF-panels
- CARB PHASE II-certificate for all types of wood-based panels

- Certificate according to Indoor Air Comfort or Indoor Air Comfort Gold for all types of wood-based panels.

** For Finland, apartment doors that are fire-protected according to EN16034 instead of emission limit value in the table above must comply with M1.*

** Fixtures are, for example, kitchen, entrance and bathroom fixtures. Individual fixture details such as a hat or shoe shelf are exempt from the requirement.*

*** The threshold of maximum 0.124 mg/m3 air for MDF boards applies up to and including 2019. After this it can be tightened. HDF is regarded as MDF and must fulfil the same limit.*

If legislation is introduced or tightened and becomes tighter than Nordic Ecolabelling's requirement levels for formaldehyde during the term of validity of these criteria, requirement O14 will be adjusted.

☒ Certificate concerning occurrence of formaldehyde-based additives in accordance with Appendix 6.

☒ Analysis report, including measurement methods, measurement results and measurement frequency. It must be clearly stated which method/standard was applied, the laboratory that conducted the analysis, and that the analysis laboratory is an independent third party. Other analysis methods than those stated in the above table may be used, provided that the correlation between testing methods can be verified by an independent third party. For more information, see Appendix 1.

☒ Certificate for products as an alternative to an analysis report. The certificate that is accepted is stated in the requirement text.

Background

The use of formaldehyde must be limited because it is hazardous to health and can lead to health problems on the production and use of the products. Formaldehyde is a toxic and sensitising substance that has a carcinogenic effect and must therefore be limited as far as possible.

Glue systems with formaldehyde are often used for wood-based panels. The development has been towards reducing formaldehyde emissions from the finished panels. However, a study shows a tendency for the indoor air in newly built, especially larger, houses to contain formaldehyde. In two out of 20 houses tested, formaldehyde concentrations were even found that exceed the threshold value set by the World Health Organisation (WHO)[42].

Formaldehyde emissions from building panels are communicated within the EU with the classification system defined in the harmonised standard for wood-based panels, EN 13986, where the current lowest emission class is E1, with the level of 0.124 mg/m^3 and 0.09 ppm. For the harmonised standard for wood-based panels, EN 13986, the TC112 technical committee has proposed a new class, E1plus, which has the following emission level: 0.08 mg/m^3 and 0.065 ppm. However, this class has not yet been finally accepted in connection with the discussions between the standardisation organisation and the European Commission, since it will be in conflict with many countries' national legislation[43].

An example is the Danish building regulations, which set the requirement that all construction materials which can give off formaldehyde to the indoor environment must be CE-marked and fulfil the most stringent formaldehyde degasification class (E1). However, construction materials are defined as materials that are permanently

[42] Senior researcher Lars Gunnarsen and PhD student Ásta Logadóttir of the Danish Building Research Institute (SBi) at Aalborg University Copenhagen.
[43] Personal contact, Gonçalo Ascensão, Program manager, CEN

incorporated in structures. The provision thus does not apply directly to e.g. furniture and fittings in which MDF is primarily used. [44]There are Nordic Ecolabelling requirements of formaldehyde emissions in a number of different criteria, such as Building Panels, Furniture, Floors, Outdoor Furniture and Playground Equipment. The requirement level for formaldehyde for this version of the criteria is harmonised with the requirement level for Nordic Ecolabelling for Furniture and fittings. It is assessed that this level is sufficiently ambitious for all of the product types for which requirements are made in construction. It is important that the requirement is ambitious, but also realistic, in terms of being able to handle all various different product types for which requirements are made in Nordic Swan Ecolabelled construction.

On this basis, together with the experience gained by Nordic Ecolabelling concerning the level of formaldehyde emissions from wood-based panels, it is assessed that requirement levels for

- MDF panels should be set at 0.124 mg/m^3, equivalent to E1 level, on using EN 717-1.
- For other panel types the already stringent level of 0.07 mg/m^3 is retained.

Both requirement levels are tight, but are assessed to be realistic for all of the product types covered by the requirement to fulfil.

Appendix 1 to the criteria document presents more detailed information on testing standards and requirements at testing and analysis laboratories. Other standardised testing methods for formaldehyde that are accepted to verify the formaldehyde requirement are also stated.

Comparison with other testing methods and certifications
Nordic Ecolabelling wishes to recognise as many certification schemes as possible, where there is a professionally sound correlation to the Nordic Ecolabelling requirements (defined in relation to 717-1).

The table in the criterion document also describes the correlation to a number of certifications/standards. They include ASTM E1333 and JIS A 1460.

- Conversion to ASTM E1333 is performed with the help of SP[45]
- The conversion to JIS A 1460 is based on the correlation 6.8561*[EN 717–1] + 0.0463 = JIS A1460 (mg/L.[46])

After dialogue with the industry and the M1 organisation, it has been possible to find a correlation to the Nordic Ecolabelling requirements[47]. The concentration in the model room, C, which is required in EN 717-1, can be calculated via the area-specific emission rate (E) and the area-specific air flow (q): c = E/q. As a general rule, the factor q should appear from the test report and can thus be used for conversion, if necessary. Cf. the M1

[44] http://boligejer.dk/formaldehyd and http://bygningsreglementet.dk/br10_02_id148/0/42, accessed: 20151412
[45] There is correction with the following factors: 1.24 = temperature correction from 23°C to 25°C, 1.1 = moisture correction from 45% to 50% RH, 1 = q = n/L (air change/loading in the EN717-1 chamber), 1.2 = edge sealing correction from EN717-1 to E1333, 1.173 = q for PB and PLW according to ASTM E1333, 1.905 = q for MDF according to ASTM E1333.
[46] Salem, Mohamed, Mohamed Zidan, 2011, Estimation of formaldehyde emission from composite wood products, Czech University of Life Sciences Prague.
[47] Dialogue with Laura Sariola from the M1 organisation and dialogue with accredited laboratories.

organisation, building panels will typically be tested for walls, which will also be the worst-case scenario in relation to the size of q. The q factor will typically be 0.5 $m^3/m^2/h$. With M1's threshold value of 0.05 $mg/m^2/h$ this will be equivalent to 0.10 mg/m^3 (based on the emitting wall surface) in the reference space according to TS 16516 and testing method ISO 16000-9. For wood-based panels for floors and ceilings, this corresponds to 0.04 mg/m^3. This means that Nordic Ecolabelling can accept M1 certificates as documentation for MDF panels. On the other hand, M1 certification does not automatically live up to the requirements of other panels, which are 0.07 mg/m^3. Here, the submission of a testing report or conversions for concrete testing performed by accredited test laboratories will be accepted, however.

Certificates as documentation
If a wood-based panel has a product certificate which shows that a specific threshold value for formaldehyde is fulfilled, this can be used for verification, instead of an analysis report. The following certificates correspond to or are tighter than the Nordic Ecolabelling requirement levels and are accepted as fulfilment of the requirement:

- E1 certificate for MDF boards
- M1 certificate for MDF boards
- CARB PHASE II certificate for all types of wood-based boards
- Certificate according to Indoor Air Comfort or Indoor Air Comfort Gold for all types of wood-based boards.

For other types of certificate and types of wood-based boards, documentation of fulfilment of the Nordic Ecolabelling requirements must be submitted, normally as an analysis report from emission testing.

Is it relevant to have requirements for other emissions?
The question of whether Nordic Ecolabelling should set requirements for other emissions besides formaldehyde was considered in the project and discussed in a workshop with the industry. It has been assessed that emission measurement is not relevant in this version of the criteria, mainly because Nordic Ecolabelling has a proactive, preventive approach to limiting emissions in indoor environments in Nordic Swan Ecolabelled buildings. It consists of three important elements:

- Strict requirements of formaldehyde emissions from panel materials, floors and fittings.
- Strict requirements for chemicals (chemical products and construction products) to minimise the risk of primary emissions.
- Requirement of moisture and water-proof buildings, to minimise the risk of secondary emissions.

Nordic Ecolabelling's principle is sufficient to ensure minimum emissions and therefore no emission measurement is required for buildings, or emission requirements for construction products in addition to the required highest permitted formaldehyde emissions.

Emission measurement of e.g. TVOC (Total Volatile Organic Compounds) entails measurement of a group of volatile organic compounds. There is no information concerning which organic compound(s) within this group might be hazardous to health. It does not make sense to regulate all of them without considering the composition in

detail. The reason is that there are no internationally accepted fixed threshold values for individual VOCs' required LCI values. An LCI (Lowest Concentration of Interest) value is deemed to be the limit to when a compound should be taken into account at all in health terms.

May 7, an exception was introduced for Finland. This is due to differences in fire protection rules and classification of exterior doors which are resistant to fire according to EN 16034. Instead of fulfilling emission limits in the above table, tambour doors in Finland must meet class M1.

Waterproof buildings - removed requirement

Requirement O38 from version 2 of the criteria, concerning waterproof buildings, has been removed. The purpose of the requirement was that products were to fulfil, and the execution of water installations was to adhere to these industry regulations, or national regulations. The industry regulations are rules for execution which fulfil the requirements in the national building regulations. Execution in accordance with industry regulations can be considered to be professional execution. Nordic Ecolabelling's experience is that national rules and industry regulations are well-established and are followed. Since a Nordic Swan Ecolabelled building, like all other buildings, must comply with current laws and regulations, any such requirement does not add any value, and has been removed after consultation.

Illuminance - requirement removed

Version 2 of the criteria had an obligatory requirement (O12) for illuminance that applied to pre-school buildings. The illuminance requirement is not a statutory requirement, but practice in the industry and is handled by the European standard, EN 12464. For pre-schools three different types of room are specified, all with the requirement of 300 lux. For school buildings, there are 26 different room specifications[48] in which the illuminance requirement varies from 100 to 750 lux. To give the scope to introduce new requirements with greater relevance in terms of the environment and indoor environment, the entire requirement has been removed.

5.7 Chemical products, construction products (goods) and materials

This chapter consists of four sections. The first section concerns requirements of lists of materials and property logbooks. The next section contains requirements of the chemical products that are used to construct a Nordic Swan Ecolabelled building. Section three comprises the requirements of construction products, goods and materials. Finally, in section four, are the requirements of timber and bamboo.

The requirement must be fulfilled for the Nordic Swan Ecolabelled building, but also for any supplementary building that is included in the Nordic Swan Ecolabelled project/assignment and which is constructed and marketed with the Nordic Swan Ecolabelled building. Examples of supplementary buildings are garages, bicycle storage rooms, refuse depots and, sheds. Fences, wooden decking, outdoor furniture, outdoor playground equipment and similar items, included in the project for the Nordic Swan Ecolabelled building are also covered by the requirements in this chapter.

[48] Examples are classrooms, whiteboards, staffrooms, libraries, audiovideo rooms, computer rooms, stairs and entrance halls.

The requirements comprised what is incorporated. The requirements do not include fuel for construction machines, marking paint, marking tape that is removed, wood to mould[49], cable lubricant or cleaning agents and similar chemical products. Nor do they include sealing foam, formwork oil, etc. used to seal or lubricate casting moulds.

In general, for ecolabelled products (Nordic Swan Ecolabel and EU Ecolabel) subject to the requirement, the documentation requirement will lapse. Nordic Swan Ecolabelled products fulfil the requirements automatically and only need to be included in the list of materials/logbook with the product and manufacturer name.

Triviality limit
As a rule, the requirements in this chapter do not have to be fulfilled for the products that are used to a very limited extent or has limited impact on health and the environment. Examples of products for which exemptions can be made:

- Touch-up paint for e.g. damage to white goods, fittings and similar.
- (Rust protection) paint to restore railings and beams, e.g. after welding and when screw holes have been drilled.
- Building fixtures (e.g. locks, handles, hole plates and hinges).
- Nails, screws, nuts, bolts, washers and similar fasteners.
- Plastic products such as palletising trays, plastic spacers, ground spacers, bends, sleeves, mounting boxes, roof boxes, inflow and outflow pipes for white goods and similar items.

Any other exemption must be communicated to Nordic Ecolabelling for approval.

The triviality limit is set to reduce the burden of documentation. The products listed above are used in mainly small quantities in new buildings and many of the products do not possess any environmental problems. Concerns can be raised for products made of PVC or poly fluorinated polymers like Teflon. These types of products will be assessed in the next version of the criteria.

5.7.1 General

O15 Product list and logbook of the building

1. There must be a list of the construction products, construction goods, materials and chemical products to be used to construct the Nordic Swan Ecolabelled building. The product list must include the name of the manufacturer and name of the product, as well as details of the type of product, showing the area of use.

2. The Nordic Swan Ecolabelled building must have a digital logbook comprising the construction products, construction goods, materials and chemical products used in production. The logbook must state:

- type of product, product category, product name and manufacturer and supplier if other than manufacturer
- the main constituent elements (applies to construction products, construction goods and materials)
- approximate location in the building.

[49] Exemptions, see requirement O27

The product list and logbook shall comprise products, goods and materials used in the building and installed in the building or in its immediate vicinity.

☒ Product list in accordance with 1 and a digital logbook in accordance with 2. Alternatively, an integrated digital document that covers both 1 and 2.

Background

The requirement of a digital logbook for properties is a further development of the requirement of lists of materials (requirement O13) from version 2 of the criteria. The list of materials has served as a good basis for keeping track of which materials and products fulfil the Nordic Ecolabelling requirements and can thus be used. The list of materials has also served as a good basis for the next Nordic Swan Ecolabelled project, since a lot of material can be re-used from the list and the process of verifying that materials and chemical products fulfil the Nordic Ecolabelling requirements will then not be so onerous. The sub-requirement 1) in requirement O19 above fully matches the previous requirement (O13 List of products/materials). Since this list of materials is linked to the approval of the Nordic Ecolabelling requirements of chemical products and construction supplies, it can already be created relatively early in the process during the project design. The property's logbook may possibly not be ready before the building is completed. We have therefore separated the logbook requirement into sub-requirement 2). There is nothing to prevent the sub-requirements from being viewed overall and handled together.

After the consultation, the requirement has been further specified by exempting products, goods and materials belonging to installation-technical systems and electrical systems from the requirement. The requirement for the logbook to report constituent substances is also removed from the Nordic Ecolabelling requirement.

The building sector accounts for a very large proportion of the use of materials in the Nordic region (approximately 40% of uses are stated), and a very large number of products are incorporated for a long time. How materials and chemical products are selected has a great impact on health and the environment, both now and in the future. The products selected today will be the waste of tomorrow. The purpose of a logbook for the property is thus to gain control of the incorporated materials, their content and where they are located. A logbook also contributes to identifying hazardous compounds before renovation and demolition, so that building, and demolition waste can be sorted and recovered on a clearer and more correct basis. This also supports the correct handling of hazardous waste arising in conjunction with conversion and demolition, and any future need for stocktaking and elimination of hazardous compounds.

To ensure that the logbook serves all of the aforementioned purposes, it must not only include the names of products and a product description to report the content, but also where it is located in the building. The location should be stated on a uniform basis, like other building-related documentation and drawings.

No Nordic country has legislative requirements concerning material logbooks for properties. In Sweden, the government's chemicals bill adopted on 28 November 2013 included the statement that "it should be examined whether there is a basis for introducing a national system for the documentation of hazardous compounds in buildings (building logbook)." This issue is viewed positively by the industry and is seen as a natural development in the industry's work on construction product declarations and a voluntary assessment system for construction supplies.

5.7.2 Chemical products

Introduction

In version 2 of the criteria the term **chemical construction/building products** was used, which gave rise to some uncertainty/confusion. In this version of the criteria, the term "chemical products" is used to describe the same thing: chemical products used to construct a building.

The exposure is no longer mainly in the external environment, nor in the working environment, but in the indoor environment. This is where the most vulnerable population group - children - spend most of the day. Nordic Ecolabelling gives great emphasis to ensuring that the chemical products in a Nordic Swan Ecolabelled building fulfil the highest environmental and health requirements. The section first includes a requirement concerning the classification of the chemical products. Then there are several requirements concerning substances used in the chemical product.

Nordic Ecolabelling requirements of chemical products are in harmony with the Nordic chemical and environmental authorities' phase-out substances. Some of the criteria for risk reduction substances are also included. Nordic Ecolabelling requirements also include endocrine disruptors as the REACH joint chemicals legislation (regulation 1907/2006/EC) does not concern endocrine disruptors for which there are no jointly accepted hazard criteria. In contrast to the Nordic Ecolabelling, REACH has no separate regulations for nanomaterials.

The term chemical product concerns a chemical substance or a mix of different chemical substances, in liquid, gaseous or solid form, used in construction work at the building site or by manufacturers of prefabricated construction elements. Chemical products used to construct any supplementary buildings, fences, decking, outdoor furniture, playground equipment and similar items are also included. Examples of chemical products are paint, adhesive, sealant, putty and dry mortar.

Goods, which form, surface or design is of significance for the function of the good, rather than its chemical composition, is not chemical products. Examples of goods are concrete elements, construction boards and plastic materials. The Nordic Swan Ecolabel requirements on goods are in chapter 5.7.3.

Definition of constituent substances and impurities

Constituent substances are all substances in the chemical product, including additives (e.g. preservatives and stabilizers) in the raw materials, but do not include impurities.

Impurities are residues from production including production of raw materials which may be found in the final chemical product at concentrations below 100 ppm (0.01 w/w, 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.

Examples of impurities are residues or reagents, residues of monomers, catalysts, by-products, purification chemicals and detergents for production equipment. Background levels of environmental contamination and carry-overs from production are also examples of impurities.

Impurities of over 1% concentration in the raw material are, however, regarded as constituent substances, regardless of the concentration in the final chemical product.

Substances known to be degradation products of the constituent substances are also themselves considered to be constituent substances.

The former version of the criteria focused on the constituent substances that were actively/purposely added and the limit were set to 100 ppm. I the new version of the criteria (3.0) the definition is tightened by introducing zero tolerance for actively added substances. Unintentionally added substances like impurities from raw material production or contaminations from the production of the chemical products may on the contrary, be present in concentrations of 100 ppm or lower.

Built on-site versus prefabricated
In principle, when anything that would normally have been built on site is purchased as prefabricated, the same chemical and material requirements will apply as if it has been built on site. Since the degree of prefabrication may change over time and also vary between the Nordic countries, this list of examples can serve as a guide to what is subject to our requirements of chemical products, whether they are prefabricated or not:

- Bathrooms/bathroom modules.
- Primed and final-coated wooden panels, both externally and internally, and ceilings. On the other hand, primed or final coated mouldings, skirtings, bases and thresholds, or stained loose timber incorporated in the Nordic Swan Ecolabelled building, are not included.
- Surface treatment of indoor staircases.
- Surface treatment of concrete/concrete elements.

Windows, doors and pre-painted interiors are always assessed to be prefabricated and are therefore not subject to the requirements for chemical products. On the other hand, there are requirements of these products in section 5.6.3.

Pipes and wires that are incorporated in prefabricated elements, for example casted in concrete elements are also covered by the requirements in chapter 4.

In prefabrication the following is valid for two-component products:

- the sub-components shall comply with the requirements, alternatively
- the hardened two component product comply with the requirements if it can be documented that protective equipment was used when the sub-components were mixed and that the finished two-component product was applied in a closed, well-ventilated system in accordance with national regulations.

On the construction site satisfactory occupational health protection cannot be guaranteed, wherefore the requirements must always be fulfilled by the sub-components. There is one exemption from this basic rule which concerns service areas where two component products, not fulfilling the chemical requirements, can be used under the following circumstances:

- The service is any of the following: fan rooms, substations, lift shafts, machine rooms, electricity centers and other areas to which unauthorized persons do not have access.
- Safety equipment is used when the sub-components are mixed.

- The hardened product is applied during well ventilation fulfilling national legislation on occupational safety and health.
- The use of safe equipment shall be documented, for example by photos.

The following is valid for concrete and cement
For cement and concrete the requirements for chemical products solely concern any chemical additives (plastizicers, accelerators, pigments, retarding and water proofing additives etc.). Nordic Ecolabelling thus does not pose chemical requirements of the actual cement or concrete.

The requirements on additives apply to additives in unhardened concrete and i prefabricated concrete elements. The requirements do not apply to additives in so called ready-made concrete products/concrete goods such as isoblock, HH-block, lecablock or concrete roof tiles.

For dry mortal, all chemical requirements in chapter 4.2 must be fulfilled since dry mortal is a chemical product as it contains unreacted chemical substances.

O16 Classification of chemical products

Chemical products used in the production of Nordic Swan Ecolabelled buildings must not be classified according to the table below. Classification must be in line with current legislation (CLP Regulation (EC) No 1272/2008.

Classification under CLP Regulation 1272/2008	
Hazard class and category	**Hazard phrases**
Toxic to aquatic organisms Category acute 1 Chronic 1-2	H400*) **), H410, H411***)
Hazardous to the ozone layer	H420
Acute toxicity Category 1-3	H300, H310, H330, H301, H311, H331
Specific target organ toxicity (STOT) with single and repeated exposure STOT SE category 1 STOT RE category 1	H370, H372
Carcinogenic Carc. 1A/1B/2	H350, H351
Mutagenic Muta. 1A/B/2	H340, H341
Toxic for reproduction Repr. 1A/1B/2	H360, H361, H362

The classifications in the Table concern all classification variants. For example, H350 also covers classification H350i.

**) Chemical anchors classified H400, are allowed in the installation of reinforcing bars in concrete constructions in apartment buildings.*

***) Sub-components in acrylic floor coatings, classified H400 are allowed to use in caterers. The Nordic countries with an authorization system, the flooring contractor must be authorized.*

****) The classification H411 is accepted for naphtha-based primers for use in waterproofing assembly (flat roofs, green roofs, courtyards, terraces and similar applications) and naphtha-based adhesives for cellular rubber insulation intended for cooling pipes and ventilation ducts indoors Proper protective equipment should be used when working with naphtha-based adhesives. The classification H411 is also accepted for primers for expansion joints on concrete, concrete-metal and metal-metal outwardly/outside on the building and for roof adhesive/adhesive for waterproofing outwardly.*

- ☒ Declaration from the manufacturer of the chemical product, in accordance with Appendix 7.
- ☒ Safety data sheet in accordance with the applicable statutory requirement in the country of application, e.g. Annex II to REACH (Council Regulation (EC) no. 1907/2006) for all chemical products.

Background

Nordic Ecolabelling seeks to ensure that the health and environmental effects of chemical products are as low as possible. Requirements are therefore made for products classified as environmentally hazardous, highly toxic, toxic, carcinogenic, mutagenic or reprotoxic not to be used to construct Nordic Swan Ecolabelled buildings.

It has been a revision objective not to change a well-functioning requirement with relevant and reasonable requirement levels via the prohibited classifications. The requirement is therefore unchanged from before, but the text is updated with the classification according to CLP. The requirement concerns the classification of the actual chemical products and not the individual compounds that may be included in the products, which is governed by subsequent requirements. The requirement must be verified by completing the attestation and submitting the current safety datasheet in the relevant country's language for the chemical products to be used. When these criteria were decided, they were specified in Annex II to REACH (Regulation 1907/2006/EC).

Exemptions from the prohibited classifications of chemical products
In conjunction with casting of the foundations for the construction of a new multi-storey building, the site and concrete contractor has stated that in cooperation with a surveyor, correct dimensions are set out for continuous reinforcement bars, to achieve stable construction. This is drilled out for in the foundations, where adhesive mortar is used for anchoring. Since this is a multi-storey property, the building is exposed to high tension forces, and the adhesive mortar must naturally be able to follow this in terms of bearing capacity.

It has unfortunately proved to be problematic to find a product that could comply with these strict requirements and at the same time fulfil the Nordic Ecolabelling requirements. The immediate problems are due to the requirements concerning the environmental hazard classification of the adhesive mortar. A number of products are excluded automatically, due to environmental hazard classification. The challenge presented by products that do not hold Environmental Hazard Classification is that they are typically not approved for reinforcement bars, or do not have the required strength for large construction projects. In terms of strength, however, these alternatives can be used for e.g. setting up balconies or other less demanding tasks.

On this basis, on 17 August 2016 an exemption was introduced for chemical anchors classified as H400 for the installation of reinforcement bars in concrete structures in apartment buildings.

On 14 December 2017, an exemption was also introduced for sub-components in acrylic flooring (a type of seamless flooring/compound flooring). The exemption does not apply to all rooms. It only applies where it is really necessary, which is in commercial kitchens. Preparation kitchens with a hot-water supply are subject to the most stringent requirements in terms of anti-slip flooring, resistance to moisture, hygiene, etc. In

commercial kitchens, compound flooring is usually the only surface that meets the requirements for functionality.

The exemption only applies to acrylic-based compound flooring, partly because acrylic flooring has the mildest classification of the three types (acrylic, epoxy and polyurethane floors), and partly because the exposure is mainly through skin contact and not inhalation.

In addition, flooring subcontractors are required to comply with regulations to ensure the health and safety of workers and must be authorised in the countries where authorisation is available.

On 31 January 2018, the requirement was adjusted to permit the use of naphtha-based primers. It is more or less always necessary to use a primer to ensure adhesion to mineral surfaces (concrete, brick, stone, etc.). For example, this is always the case outdoors prior to sealing, and also when installing exterior waterproofing on surfaces such as patios, gently sloping roofs, courtyards/courtyard decks and beneath green roofs. Without excellent adhesion, there is a real risk of problems with moisture and frost damage. It is often possible to use water-based primers, but not when the temperature is around +10°C or lower. Water-based primers do not work if the concrete is very smooth or non-porous. Water-based primers meet Nordic Ecolabelling's requirement without adjustment.

There are no technical or quality-related differences between xylene-based or naphtha-based primers. Both types of primer work for all applications and structures and are considered to be equal. Nordic Ecolabelling has decided not to permit the use of xylene-based primers that have a very strong aroma. Naphtha-based primers are permitted to enable primers to be used in cold weather conditions too. These consist of 45-65% hydrocarbons of various blends and various carbon chain lengths. Naphtha is present in many different blends, where some, but not all, have the self-classification H411. There is no harmonised classification of naphtha, which means that the classification of a product is rather random, depending on the manufacturer's access to ecotoxicity data.

On June 6, 2020, an adjustment was made to permit the use of naphtha-based adhesive. The water-based adhesives, intended for cellular rubber insulation of cooling pipes and ventilation ducts, do not prove to function satisfactorily at temperatures below + 5°C. Available alternatives, within the same application area, are naphtha-based adhesives. These work during all months of the year, including the winter months. Therefore, the exception for classification H411 has been extended to include naphtha-based adhesives intended for cellular rubber insulation.

O17 CMR substances

Chemical substances that are classified as carcinogenic (Carc.), mutagenic (Muta.) or reprotoxic (Repr.) according to CLP Regulation 1272/2008, may not be constituent in chemical products used in the production of Nordic Swan Ecolabelled buildings, see Table below.

Classification under CLP Regulation 1272/2008	
Hazard class and category	**Hazard phrases**
Carcinogenic Carc. 1A/1B/2	H350, H351

Mutagenic Muta. 1A/1B/2	H340, H341
Reprotoxic Repr. 1A/1B/2	H360, H361, H362

The classifications in the Table concern all classification variants. For example, H350 also covers classification H350i.

Exemptions are made for:

- Tin organic compounds see O20.
- The level of free formaldehyde (from formaldehyde not intentionally added or from formaldehyde-releasing substances) ≤ 200 ppm (0.02% by weight) in the end-product.
- D4 (Octamethyl cyclotetrasiloxane, CAS-no 556-67-2) as a residue from the production of silicon polymers ≤ 1000 ppm.
- Vinyl acetate (CAS-no 108-05-4) as a residual monomer in polymers ≤ 1000 ppm.
- Glyoxal (CAS-no 107-22-2) ≤ 100 ppm (0.01% by weight) in the final product if the pH-value in the final product is higher than pH 8.
- Mineral oil in naphtha-based primers in waterproofing assembly (flat roofs, green roofs, courtyards, terraces and similar applications), in primers for expansion joints on concrete, concrete-metal and metal-metal outwardly/outside on the building and as roof adhesive/adhesive for waterproofing outwardly. The exemption applies provided that the mineral oil has been tested with the IP 346 method (Determination of polycyclic aromatics in petroleum fractions) showing that the mineral oil contains less than 3% DMSO extract, alternatively that it is shown that the benzene content is lower than 0,1%. This must be verified by the safety data sheet.
- TiO_2 which is added in powder form during raw material production.
- The dispersant trimethylolpropane (CAS #: 77-99-6) up to 1% by weight in pigment. Time-limited exception that applies until 2022-05-31.

☒ Declaration from the manufacturer of the chemical product, in accordance with Appendix 7.

☒ Safety data sheet in accordance with the statutory requirement in the country of application, e.g. Annex II to REACH (Council Regulation (EC) no. 1907/2006) for all chemical products.

Background

Substances that may cause cancer, change genetic material or interfere with reproduction (known as CMR substances in categories 1A and 1B) are prioritised substances within the EUs chemical legislation, due to their inherently dangerous properties. It is therefore of central importance to considerably reduce, and in the long term move away entirely from, the use of CMR substances. It is not permitted to use CMR substances in chemical products that are accessible to consumers, but they do occur in other products. The most common applications at this time are in fuels, propellants, soft plastics, rubber tyres, paints and pressure treated timber.

In addition to the requirement concerning the classification of the actual chemical products, it is also required that chemical products must not contain substances that are carcinogenic, mutagenic or reprotoxic (CMR substances). Nor may chemical products contain substances that are **suspected** to be carcinogenic, mutagenic or reprotoxic (category 2).

One consequence is that the CMR requirement partly overlaps with the previous requirement concerning chemical product classification. The requirement has been updated with classification according to CLP but is otherwise unchanged from version 2.

Exemption from the prohibition of CMR substances
Precisely as in version 2 of the criteria, there are exemptions for the organic tin compounds dibutyltin (DBT) and dioctyltin (DOT) that may be included in certain sealing products at certain specific levels. The exemption is stated in requirement O23. All other organic tin compounds, other products or higher levels than those listed, are prohibited. The reason for the exemption for DBT and DOT in these sealing products is that tin compounds are used as catalysers in sealants that harden via 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. If too much is added, the skin on the sealant will develop too quickly, making it difficult for the user to ensure a fine, glossy finish before the product hardens. If too little is added, the sealant will not harden correctly, giving it poorer mechanical properties and a shorter functional lifespan. The sealant will be sticky on the surface and attract dirt. Organic tin compounds are commonly found in silicone sealants.

Formaldehyde is a toxic and allergenic substance that has carcinogenic effects and should therefore be avoided as far as possible. Nordic Ecolabelling knows that newly produced polymers may contain monomer residues in the form of formaldehyde. There is therefore an exemption that permits formaldehyde as a pollutant in the newly produced polymer at a highest level of 250 ppm, which is in harmony with the equivalent requirements in the criteria for chemical building products. Formaldehyde (CAS number 50-00-0) or formaldehyde forming substances, on the other hand, may not be actively added to the chemical product.

Desiccant/drying agent is added to alkyd paints so that the paint can dry. Desiccant is mainly used in alkyd paints for both consumer and industrial use. It has emerged that salts containing Cobalt and Zirconium will be classified as reprotoxic in category 2, with H361. It is possible to replace this desiccant with others that are less hazardous. To enable industry to do this under controlled conditions, Nordic Ecolabelling grants a time-limited exemption.

An exception is made for the siloxane D4 (octamethylcyclotetrasiloxane, CAS number 556-67-2), which is classified as reprotoxic in class 2 with the hazard statement H361f; "Suspected of damaging fertility" and classified as being hazardous to the aquatic environment in chronic category 4 with the hazard statement H413; "May cause long lasting harmful effects to aquatic life"[50]. There are also concerns for the cyclosiloxanes D5 (decamethylcyclopentasiloxane, CAS number 541-02-6) and D6 (dodecamethylcyclohexasiloxane, CAS number 540-97-6), but these are not classified in the CLP Regulation. The European Chemicals Agency (ECHA) has also found that D4 and D5 are very persistent (vP) and are highly bioaccumulative (vB), and the EU is now assessing whether D6 are persistent, bioaccumulative and toxic (PBT)[51]. If a chemical

[50] The European Chemicals Agency, ECHA, search on octamethylcyclotetrasiloxane D4, http://echa.europa.eu/information-on-chemicals/cl-inventory-database/-/cl-inventory/view-notification-summary/121828 (06.01.2016)
[51] Miljøstatus i Norge, Siloksaner (Environmental status in Norway, siloxanes), published on 22.06.2015 by the Norwegian Environment Agency: http://www.miljostatus.no/Tema/Kjemikalier/Noen-farlige-kjemikalier/Siloksaner/(06.01.2016)

product contains more than 3% of a substance classified with H361f, the product must be marked as H361.

D4 is used as a monomer in the production of silicone polymers and there will be residual quantities of D4 in silicones for e.g. sealants, according to a consultation response from Dana Lim A/S. In the same consultation response, reference is made to how experience from the approval of BREEAM-NOR products shows that it is not generally possible to find silicone sealants that are guaranteed free of D4. Silicone sealants are often used outdoors and for wet rooms.

In the report "Hälsoskadliga kemiska ämnen i byggprodukter – förslag till nationella regler" (Hazardous chemical substances in construction products – proposed national regulations) from the Swedish Chemicals Agency,[52] it is mentioned that the average content of D4 in sealants and glue is lower than 4%. The value is based on data from Byggvarubedömningen (Construction Materials Assessment) and SundaHus.

Other public sources of information on the quantities of the cyclosiloxanes D4, D5 and D6 in chemical products such as glue and sealants have not been found. Nor is it known to what extent the siloxanes react on the hardening of the products, and thereby the extent to which they are found in the final products, or will be reformed or emitted later, on exposure to light and water. Nordic Ecolabelling has decided to introduce an exception for residual quantities of D4 up to and including 1,000 ppm originating from the production of silicone polymers.

After consultation, an exception for vinyl acetate (CAS 108-05-4) in up to and including 1,000 ppm has also been introduced. Vinyl acetate occurs as a residual monomer in most of the water-based binding agents used for water-based glues (wood glue, felt glue, floor glue, etc.). Even though the industry is working to reduce the vinyl acetate content, especially after this substance was classified as Carc. 2, this is a process that takes time. Therefore, this exception in this version of the criteria is required. Equivalent exceptions are also found in the Nordic Ecolabelling criteria for chemical construction products, and in office and hobby products.

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 for the present. 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.

Because of the need to permit the use of naphtha-based primers, the requirement for constituent CMR substances (O17) must also be adjusted. Under the CLP Regulation, it is not necessary to classify a product as carcinogenic if the DMSO extract weighs less

[52] Swedish Chemicals Agency, "Hälsoskadliga kemiska ämnen i byggprodukter – förslag till nationella regler" (Hazardous chemical substances in construction products – proposed national regulations) 8/15, Table 2. Summary of the average content of particularly hazardous substances in various construction product categories, based on the reported content of the SundaHus and Byggvarubedömningen databases. http://www.kemi.se/global/rapporter/2015/rapport-8-15-halsoskadliga-kemiska-amnen-i-byggprodukter.pdf (downloaded 07.01.2016)

than 3% of the oil. The extract is obtained by extracting the oil into the DMSO, into which the more organic phase (which includes PAHs) dissolves. The 3% threshold limit value indicates that the amount of constituent PAHs with carcinogenic and mutagenic characteristics is less than 0.1% or 1000 ppm. Another way to write this is to state that the benzene content is less than 0.1%.

Since Nordic Ecolabelling only permits 100 ppm of pollutants: (in this case, the PAHs are pollutants left over after a refining process) we must introduce exemptions that permit up to 1000 ppm of PAHs in naphtha-based primers. This must also be checked by case officers when they examine the safety data sheet in conjunction with listing in the Building product portal.

Grinding and blasting are work steps that dust at the construction site. Dusting work is regulated in work environment regulations. In the case of grinding of eg paint where titanium dioxide (TiO_2) has been added during production, TiO_2 does not release into its free form. It is TiO_2 in its free form that gives rise to classification that is suspected to cause cancer when inhaled.

O18 Preservatives in indoor paints and -varnishes

The amount of preservative/combination of preservatives is limited according to the tables below.

The requirement on classification of the chemical product (O16) and other chemical requirements on constituent substances must also be met by indoor paint and indoor varnishes.

Concentration limits for preservatives totally.

Preservatives totally	**Concentration limit**
Paints, varnishes, base paints with tinting paints etc. for indoor use.	700 ppm (0,07% w/w)
Wet room paint specifically	2500 ppm (0,25% w/w)

Concentration limits for isothiazolinone compounds.

Type of preservatives	**Concentration limit**
Isothiazolinone compounds totally	500 ppm (0,05% w/w)
2-Methyl-2H-Isothiazol-3-one (MIT*) (CAS-no: 2682-20-4)	100 ppm (0,01% w/w)
5-Chloro-2-Methyl-2H-Isotiazol-3-one/2-Mehtyl-2H-Isothiazol-3-one (CMIT/MIT in mixture 3:1) (CAS-no: 55965-84-9)	15 ppm (0,0015 w/w)

The term preservative refers to both preservatives for tinned products (in-can) and preservatives for the surface finish.

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

Note that Dithio-2,2'-bis-benzmethylamide (DTBMA) is to be included in the total amount of isothiazolinones.

** Note that the shortening MI may also be used.*

✉ Declaration from the manufacturer of the chemical product, in accordance with Appendix 7.

☒ If preservatives are present, a calculation is required to clearly show that the requirement is fulfilled.

O19 Preservatives in other chemical products for indoor use

The amount of preservative/combination of preservatives in other chemical products for indoor use is limited according to the Table below. Chemical products for outdoor use are not restricted regarding preservatives.

The requirement on classification of the chemical product (O16) and other chemical requirements on constituent substances must also be met.

Concentration limits for preservatives in other chemical products for indoor use.

Preservatives	Concentration limit
Isothiazolinone compounds totally*	500 ppm (0,05w/w)
A mixture (3:1) of CMIT/MIT (5-Chloro-2-Methyl-2H-Isothiazol-3 one/ 2-Methyl-2H-Isothiazol-3-one (CAS-no 55965-84-9)	15 ppm (0,0015 w/w)
Iodopropynyl butylcarbamate (IPBC) (CAS-no: 55406-53-6)	2000 ppm (0,2% w/w)
Bronopol (CAS-no: 52-51-7)	500 ppm (0,05% w/w)

** Note that Dithio-2,2'-bis-benzmethylamide (DTBMA) is to be included in the total amount of isothiazolinones.*

☒ Declaration from the manufacturer of the chemical product, in accordance with Appendix 7.

☒ If preservatives are present, a calculation is required to clearly show that the requirement is fulfilled.

Background

The requirement is completely new. The requirement and the levels for highest permitted preservatives are harmonised with equivalent requirements in the proposed criteria for Nordic Swan Ecolabelled indoor paints and varnishes and for products for indoor use in the proposed criteria for Nordic Swan Ecolabelled chemical building products respectively. Levels for the highest permitted concentrations of the respective preservatives are the same as apply to Nordic Swan Ecolabelled indoor paints and varnished. For all other chemical products for indoor use, the levels are the same as apply for Nordic Swan Ecolabelled Fillers, which is assessed to be reasonable for a Nordic Swan Ecolabelled building.

Preservatives are added to liquid products to prevent bacterial growth in the products, in-can preservatives. The composition of the products may also affect the need for preservatives. In some products preservative are also added as film preservatives, i.e. so that the final film is not attacked by algæ, mould, etc. This applies for wet room paint for example. For this reason, there is a specific value for wet room paint.

Isothiazolinone compounds

Isothiazolinones are used as a preservative in many products, where they act as fungicides, bactericides 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-affecting characteristics. In general terms, it has been common to preserve chemical building products using formaldehyde and/or formaldehyde-releasing substances. In this

perspective, isothiazolinones are better, as the risks of their sensitising effect are preferable to the risk of formaldehyde classed as carcinogenic. Yet since new findings have shown that MI (methylisothiazolinone) can be classified as airborne allergens, even in small quantities[53,54] it is important to limit their use in order to ensure a good indoor environment.

MIT has no harmonised classification but is self-classified by the industry. The majority of companies in the EU have classified MIT as Skin sense 1 with H317. A harmonised product classification is anticipated. If MIT is included in a blend in concentrations from 0.1% up to 1%, the final product must be labelled as "Contains isothiazolinone, may cause an allergic reaction".

Isothiazolinones are often used in blends, i.e. where several different variants are included in the same products. The requirement therefore determines the total amount of isothiazolinones and not individual isothiazolinone compounds.

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), called CMIT+ MIT (3:1), has been more strictly limited because this blend is highly allergenic (H314 and H317) and environmentally hazardous (H400 and H410). The limit is 15 ppm (0.0015% by weight, 15 mg/kg) in Nordic Swan Ecolabelled chemical building products for all categories. The limit of 15 ppm was the limit that, according to the Dangerous Preparations Directive, led to labelling with the risk phrase that the product "contains XX and can cause an allergic reaction". In view of CLP the limit for labelling of the products has been changed to 1.5 ppm for CMIT/MIT. However, Nordic Ecolabelling has maintained that 15 ppm of this blend can be included in the products, to also have an effect on the product. On the addition of levels as low as 1.5 ppm of CMIT/MIT, there is no good preservative effect.

Bronopol
Nordic Ecolabelling has been aware that many paints and adhesives contain low amounts of the biocide bronopol. Thus, the requirement is completed with an exception for bronopol up to max 500 ppm (0,05% of weight).

O20 Other substances excluded from use

The following substances may not be constituent in chemical products used in the production of Nordic Swan Ecolabelled buildings:

- Substances on the Candidate List*.
- Substances evaluated by the EU to be PBT substances (persistent, bioaccumulative and toxic) or vPvB substances (very persistent and very bioaccumulative) in accordance with the criteria in Appendix XIII in REACH, including substances those have not been evaluated but are considered to meet the requirements.
- 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**.

In addition, the following individual substances and substance groups are prohibited or restricted. There may be overlap between the substances listed below and substances categorized over.

[53] DR (Danish Broadcasting Corporation): http://www.dr.dk/Nyheder/Indland/2014/05/20/104956.htm
[54] National Allergy Research Centre (Videncenter for Allergi):
http://www.videncenterforallergi.dk/?site=1&side=7&id=125&pub=606.

- Short-chain chlorinated paraffins (C10-C13) and medium chain chlorinated paraffins (C14-C17).
- Perfluorinated and polyfluorinated alkylated substances (PFAs).
- APEO – alkylphenol ethoxylates and other alkylphenol derivatives (substances that release alkylphenols on degradation).
- Brominated flame retardants.
- Phthalates***.
- Bisphenol A, bisphenol S and bisphenol F
- The heavy metals lead, cadmium, arsenic, chromium (VI), mercury and their compounds.
- Volatile aromatic compounds >1% by weight ****.
- Organic tin compounds. Exemptions are made for dibutyltin (DBT) and dioctyltin (DOT) which are permitted in the following levels in sealing products (the primer and joint product respectively):
    - Maximum 0.5% in silane hardener systems.
    - Maximum 0.2% in other hardener systems.

Volatile aromatic compounds are any aromatic compound having an initial boiling point less than or equal to 250°C measured at a standard pressure of 101.3 kPa. For paints and varnishes volatile aromatic compounds are instead defines as aromatic compounds having a boiler pressure of at least 0, 01 kPa at 293.15 K.

Note that Tributyltin (TBT) and Triphenyltin (TPT) are not accepted regardless of content or product type.

Phthalates are substances with the chemical structure 1,2-benzenedicarboxylic acid. Non-phthalates such as DINCH (EC No. 431-890-2) and DOTP / DEHT (CAS No. 6422-86-2) are not included in the definition and are not prohibited.

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

** Excluded are D4 (octamethylcyclotetrasiloxane, CAS No. 556-67-2), D5 (Dekamethylcyclopentasiloxane, CAS No. 541-02-6) and D6 (Dodecamethylcyclohexasiloxane, CAS No. 540-97-6) as residual amount from silicone polymer production ≤ 1,000 ppm each.*

*** See document Annex 1-Candidate list of 553 substances on the following link: http://ec.europa.eu/environment/archives/docum/pdf/bkh_annex_01.pdf*

**** The phthalates DINP (CAS-no 28553-12-0 and 68515-48-0), DIDP (CAS-no 26761-40-0 and 68515-49-1) and DIUP (CAS-nr 85507-79-5) are however permitted in sealants and primers in expansion joints on concrete, concrete-metal and metal-metal outwardly/outside on the building including the use on balconies, exterior corridors and similar applications.*

***** Naphtha based primers for waterproofing assembly (flat roofs, green roofs, courtyards, terraces and similar applications), in primers for expansion joints on concrete, concrete-metal and metal-metal outwardly/outside on the building and roof adhesive/adhesive for waterproofing outwardly may contain up to 20% by weight of volatile aromatic compounds.*

☒ Declaration from the manufacturer of the chemical product, in accordance with Appendix 7.

☒ Safety data sheets according to prevailing European legislation for chemical products.

Background

The requirement is a list of unrequired compounds (a negative list) and was also included in version 2 of the criteria (requirements O17 & O18) and is generally unchanged. The requirement has been reviewed, however, to be clear but also not overlap with other requirements. This means that substances that are prohibited by e.g. the CMR requirement (O21) must not be listed if they are not assessed to provide any necessary extra clarity. Examples of substances/groups of substances that are not included in the negative list in version 3 are: antimony trioxide that is suspected to be carcinogenic (Carc

3), benzo(a)pyrene and monoacrylamide classed as carcinogenic. The boron compounds that Nordic Ecolabelling is not intended to limit (boric acid, sodium perborate, perboric acid and sodium borate/borax) are also covered by the requirement of CMR compounds and are therefore not stated as a separate item. Bisphenol A that was a separate item in version 2 of the criteria is covered by potential endocrine disruptors. In addition, bisphenol S and bisphenol F are added after consultation. Review of the literature has shown that these substances, which are abbreviated analogously to BPS and BPF, are just as hormonally active as BPA and have hormone-disrupting effects[55].

An important change in the revision is that the opportunity to use sealants with certain specific phthalates has been removed. Nordic Ecolabelling is aware of the positive development taking place with sealants, whereby phthalates are being replaced with plasticizers that are not phthalates. Mainly in acrylate paints (interior wall paints), the phthalate DINP is substituted with other plasticizers by manufacturers. There are also sealants that do not contain any plasticizing agents at all but are based on other chemicals. On this basis, Nordic Ecolabelling assesses that it is reasonable to set the general requirement that chemical products, including sealants, must be free of phthalates. An exemption from the general rules is required, however. To avoid material breach and cracking in the connected building components it is necessary to use very elastic sealants and that the grouting is broad enough to take up movement. To function well over time, the sealant must have good and resilient attachment to the grouting edges. For porous materials such as concrete it is often necessary to first use a primer. The exemption introduced in generation 2 of the criteria (on 13 May 2014) for the phthalates Diisononyl phthalate (DINP) and Diisodecyl phthalate (DIDP) in exterior expansion joints thus still remains, since these types of sealant may still contain these phthalates.

The exemption for tin organic content now also applies to primers included in sealant systems for porous material. Appendix 8 gives a brief outline of the background to the prohibition for each of the substances/groups of substances.

Nordic Ecolabel decided, 4 February 2019, to exclude siloxanes D4, D5 and D6 who are present as impurities in silicone products/raw materials. From June 2018, these siloxanes have been given a new classification based on the properties of PBT and vPvB. They have therefore ended up on the candidate list. They have previously not had this classification and the limit value is based on customer contacts. An assessment is that there is a development towards a lower concentration of D4, D5 and D6. Nordic Ecolabelling will monitor this development.

Exemption for primers for expansion joints

Before the sealant is applied, the porous surfaces must be prepared with a primer to achieve proper adhesion. The joint itself (without primer) will not have a sufficiently large contact surface if the underlay is porous, and there is a very great risk that the joint will slip, which can e.g. lead to moisture penetration. A need has been identified to exempt these primers for expansion joints since they contain aromatic solvents. Expansion joints entail that the joint must fulfil the highest requirements of flexibility and movement uptake.

[55] Bisphenol S and bisphenol F: A Systematic Review and Comparison of the Hormonal Activity of Bisphenol A Substitutes. Rochester, J.P and Bolden, A.L, Environmental Health Perspectives, 5. March 2015.

The requirement for volatile aromatic compounds not to exceed 1% by weight is new in generation 3. Aromatic compounds are not beneficial to health and have long been in focus and have been replaced with less hazardous alternatives.

Primers for expansion joints often contain epoxy, which has low solubility. Aromatic solvents, in this case xylene and ethylbenzene, must be used to dissolve the epoxy. The xylene concentration is 5-10%, which is clearly above Nordic Swan Ecolabelling's permitted limit. The ethylbenzene concentration is 1–2.5%. The product itself may not have a classification that does not comply with the Nordic Swan Ecolabelling requirements.

Expansion joints are a special type of outdoor joint for when very large concrete surfaces are to be joined together, normally prefabricated façade elements. The most common joints both indoors and outdoors are around windows. Even if windows are mounted in concrete façade elements, this is not an expansion joint. The window is too small to require an expansion joint. Only very large window sections with metal frames mounted in concrete would require an expansion joint. The amount of primer for expansion joints used in Nordic Swan Ecolabelled buildings is very small, but still too large to lie within the minimal limit for chemical products.

After a decision in NKG on 9 October 2017, the requirement concerning aromatic compounds was adjusted so that the concentration for primers for expansion joints may include aromatic compounds at up to 15% by weight. In January 2018 the exemption was extended also to adhesives and roof adhesives and the limit was raised to 20% by weight of VAH.

The Nordic criteria group approved on 17 October 2018 the exception for DIUP (CAS-nr 85507-79-5) in motion joints for outdoor use. The reason is that all technical knowledge about the substance indicates that the exposure is lower, and we should not prevent anything that seems better than the already excluded phthalates. However, in the forthcoming evaluation and revision, the exception for phthalates in expansion joints will be reviewed and hopefully removed.

On 12 December 2018 the Nordic Criteria Management Group decided to prolong the criteria until 31th of December 2022

Adjustment of organotin catalysts

A need was also found to modernise Nordic Swan Ecolabelling's description which permits organotin catalysts in order to accelerate the hardening of certain chemical (building) products. Several more polymers and new hardening systems than those listed in the Nordic Swan Ecolabelling requirements are available in the market, and the hardening systems are not always related to specific polymers, as described by Nordic Swan Ecolabelling.

In brief, we can say that all polyurethane-based products (irrespective of hardening system) have a lower catalyst concentration than other products. Other products are primarily silicone products, MS polymers and epoxy polymers.

Another factor governing how much catalyst is required is whether the product is transparent or whether it is coloured, in which case it may have a large amount of filler. Transparent products always have a higher concentration of polymer and require higher catalyst concentrations. Filled products require smaller amounts of catalyst.

After a decision by NKG on 9 October 2017, the requirement was adjusted so that the exemption for organotin compounds is based on the hardening system, instead of the polymer type, and continues to "take account" of the amounts required for a transparent product.

O21 Nanoparticles in chemical products

Nanoparticles from nanomaterial* may not be constituent in chemical products, with the following exemptions:

- Pigments**
- Naturally occurring inorganic fillers***
- Synthetic amorphous silica***
- Polymer dispersions

** The definition of nanomaterial follows the European Commission's definition of nanomaterial of 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 when, for at least 50% of the particles in the number size distribution, one or more external dimensions is in the size range 1-100nm.*

*** Nano-titanium dioxide is not considered to be a pigment and is therefore covered by the requirement.*

**** This applies to fillers covered by Annex V, item 7 of REACH.*

***** This applies to traditional synthetic amorphous Silica (SiO_2) and Calcium Carbonate ($CaCO_3$) with or without chemical modification.*

✉ Declaration from the manufacturer of the chemical product, in accordance with Appendix 7.

Background

There is still great uncertainty related to how nanoparticles affect health and the environment[56]. Based on the precautionary principle, Nordic Ecolabelling wishes to take a restrictive approach to the use of nanoparticles and the requirement is based on the environmental consequences when nanoparticles are released to the surroundings (indoor environment or the surrounding environment, seen over the entire life cycle). The requirement concerns chemical products that are used for the production of Nordic Swan Ecolabelled buildings and is in line with equivalent requirements in Nordic Swan Ecolabelled chemical building products.

The definition of nanomaterials follows the European Commission's definition of nanoparticles[57]: "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 are in the size range of 1-100 nm.

The requirement means that newer nanomaterials produced with the intention of containing nanoparticles must not be used. Examples of such nanoparticles are fullerenes, carbon nanotubes, nanosilver, nanocopper and nano-titanium dioxide. Traditional fillers may be included, however, just as pigments that are exempt from the requirement.

Polymer dispersions (nano-emulsions) and amorphous silica (SiO_2.) are also exempt from the requirement. All of the substances included, irrespective of exemptions, must fulfil all

[56] European Council, Recommendation 2017 (2013), Provisional version, Nanotechnology: balancing benefits and risks to public health and the environment. Available on page: (21/5-13).
[57] COMMISSION RECOMMENDATION of 18 October 2011 on the definition of nanomaterial (2011/696/EU).

other relevant requirements in the document. Appendix 9 contains a more in-depth description of nano, exemptions and application of the requirement.

After consultation, it has been added that calcium carbonate in nanoform with and without surface treatment is also exempt from the prohibition of nanomaterials in chemical products. Contact with the industry[58] showed that UFPCC (Ultrafine Precipitated Calcium Carbonate) is used in SMP grouting (SMP = silan modified polymer (coatable)). Amorphous silica is not stable in SMP systems (can cross-react with the raw materials), but is used in silicone sealants. UFPCC is e.g. used to modify flow properties and improve creep. According to the industry, silica and carbon black produce far more dust than UFPCC. UFPCC has been used for the last 30 years.

A challenge on using nanomaterials is the lack of information on health and environmental effects, and in particular long-term effects that may be unique for the nano form of a material. In addition, the surface treatment of nanoparticles will in turn give the particles entirely new characteristics. Nordic Ecolabelling is aware that it is a challenge to adapt the testing methods in REACH to substances in nanoform and believes that it will take time for the necessary documentation to be in place. In this case, the nanoparticles will be in a matrix that is not exposed to grinding, so that the consumer is minimally exposed to the particles. Nordic Ecolabelling does not have enough information concerning which alternatives are available if we do not allow exemptions for UFPCC in this instance. Nordic Ecolabelling therefore exempts UFPCC in the requirement.

Requirements for chemical products removed

The requirement that material safety data sheets for all chemical products must be made available to Nordic Ecolabelling (O14 in version 2) has been removed since this generally corresponds to what is already required by legislation. The only difference is that, as a minimum, legislation requires material safety datasheets for classifiable products, while the Nordic Ecolabelling requirement has applied to all chemical products.

Since the requirement for chemical products must be verified with a relevant safety datasheet, in practice the consequence is very small or not at all.

The requirement concerning handling of chemical products (O20 in version 2) has also been removed as this is governed by legislation in the Nordic countries and the requirement is not assessed to give any added value.

5.7.3 Construction products, construction goods and materials

Requirement O22 comprises of two parts. First a list of construction products, goods and materials to which the requirement applies. Then the chemical substances that may not be constituent are listed. By the term included is meant substances added by the producer or its sub suppliers and that are included in the end-product with more than 100 ppm (0.01% by weight).

[58] E-mail and telephone contact with DanaLim in autumn 2015.

For clarity the definition 'construction goods' is used, which includes fittings. Fittings are not defined as construction products and are therefore not covered by the Construction Product Regulation (305/2011/EG).

O22 Substances excluded from solid building products

The requirement applies to the following product categories (see Appendix 8):

- Sealing products on walls, foundation and roofing.
- Thermal, acoustic and technical insulation*).
- Interior and exterior building panels. Does not include panels of solid wood, laminated timber, veneer, OSB, plywood, MDF/HDF and chipboard.
- Wood that is impregnated as protection from rot, blue stain and mould.
- Wood composites.
- Interior plastic coverings for floors, ceilings and walls. Service areas are exempt from the requirement**)
- Drainage pipes, heavy current cables, (electrical) conduits and plastic pipes for central vacuum cleaners. Service areas are exempt from the requirement**)

In the above groups of construction products, the following substances may not be included:

- A substance on the EU's Candidate List***)
- Substances evaluated by the EU to be PBT substances or vPvB substances in accordance with the criteria in Appendix XII in REACH including substances those have not been evaluated but are considered to meet the requirements.
- Substances classified as carcinogenic, mutagenic or toxic for reproduction (CMR) Category 1A and 1B.
- 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****).

In addition, the following individual substances and substance groups are prohibited or restricted. There may be overlap between the substances listed below and substances categorized over.

- Short-chain chlorinated paraffins (C10-C13) and medium chain chlorinated paraffins (C14-C17).
- Perfluorinated and polyfluorinated alkylated substances (PFAs).
- Alkylphenol ethoxylates (APEO) and other alkylphenol derivatives (substances that release alkylphenols on degradation).
- Brominated flame retardants***** ******)
- Phthalates.
- The heavy metals lead, cadmium, arsenic, chromium (VI), mercury and their compounds.
- Bisphenol A, bisphenol S and bisphenol F.
- Boric acid, sodium perborate, perboric acid, sodium borate (borax) and any other boron compounds classed as carcinogenic, mutagenic or reprotoxic.
- Tin organic compounds.

Phthalates are substances with the chemical structure 1,2-benzenedicarboxylic acid. Non-phthalates such as DINCH (EC No. 431-890-2) and DOTP / DEHT (CAS No. 6422-86-2) are not included in the definition and are not prohibited.

**) In EPS and XPS insulation material manufactured by polystyrene, residues of styrene monomer are allowed in maximum l000 ppm in the polystyrene (i.e. in the raw material).*

***) Service areas are fan rooms, substations, lift shafts, machine rooms, electricity centres and other areas to which unauthorised persons do not have access.*

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

*****) See document Annex 1-Candidate list of 553 substances on the following link: http://ec.europa.eu/environment/archives/docum/pdf/bkh_annex_01.pdf*

******)Insulation foam (EPS and XPS), exposed for risks of ignition during the production (at the construction site or during manufacturing of prefabricated construction parts) may, when the fire protection assessment show medium to high risk of fire, be protected with butadiene styrene brominated copolymer (CAS 1195978-93-8) as flame retardant. Examples of risks of ignition are welding works, electricity errors, halogen lighting or concentrated sunlight. The fire protection assessment shall be performed by a competent expert technician (construction expert, fire risk expert or person with similar competence). The license holder must apply in written and project specific for exception, to Nordic Ecolabelling.*

*******) The material in (electrical) conduits may contain brominated flame retardants provided that the following limits are fulfilled:*

- Bromine content (Br) ≤ 0.15%

- Chlorine content (Cl) ≤ 0.15%

- Total content: bromine content (Br) + chlorine content (Cl) ≤ 0.2%

The content must be verified using Ion Chromatography (IC) according to the methods in EN 14582 or modified IC-methods according to EN50642.

☒ Declaration from the manufacturer of the construction product, construction goods or construction material in accordance with Appendix 9.

☒ Construction product declaration or corresponding if such is created for the product, as a supplement to Appendix 9.

Background

The requirement comprises two parts. First it is described which construction products are included, i.e. which are to verify the chemical content. The purpose is to ring in the most important construction supplies and thereby the material within the vapour barrier (moisture barrier), supplemented with known problematic material outside the vapour barrier, see Figure 3.

Products included

Interior and exterior building panels and composite wood, i.e. material that is normally a combination of wood and plastic (WPC) have been added to the list. The requirement is also specified that insulation material includes thermal, acoustic and also technical insulation. The term "impregnated wood" from version 2 of the criteria has been specified as "wood impregnated against rot, blue stain and mildew", which been the prevailing interpretation. Table 5 presents a more detailed description of the various product groups in the requirement.

Just as described in section 5.6.2 Chemical products, as a general rule the Nordic Ecolabelling requirements must apply irrespective of whether the material is incorporated on site or purchased assembled in prefabricated elements. This means that irrespective of whether the carcass[59] (e.g. wall elements, façade elements, joint elements), roof trusses or

[59] The carcass may be of loose timber or prefabricated building elements, often in concrete or wood. After the carcass is built, supplementary structures are added, i.e. windows, doors, stairs, installations, painting and fittings.

bathrooms and similar are built on site or as prefabricated building elements, the requirement in O22 will apply.

Construction supplies that are purchased and installed, such as windows and doors, are not subject to this requirement at all.

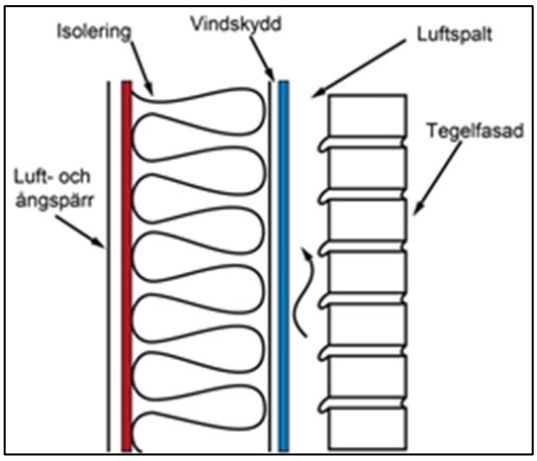


Figure 3: Outline to show an air/vapour barrier that prevents hot, moist indoor air from penetrating the insulation, which would give moisture damage. The air/vapour barrier is always placed on the warm side of the building envelope. Weather and wind protection is placed outside the building envelope in order to prevent the wind blowing through the building envelope, and to protect from precipitation.

Which substances are not permitted?

The second part of the requirement concerns a list of the substances/groups of substances that may not be contained in these construction supplies in quantities of 100 ppm or more. The substances on the list include the substances and groups of substances that are e.g. included on the Norwegian A20 list of substances that must be avoided in solid building products.

The item list is found in version 2 of the criteria, but has been revised as follows:

- First the substances on the Candidate List are listed. This is the European chemical authorities' list of particularly hazardous substances. When a substance is on the Candidate List, requirements are made concerning notification, information and permits. The requirement partly entails harmonisation with the REACH legislation's requirement of an information obligation, Article 33. Two important differences are that the Nordic Ecolabelling requirement is a prohibition of substances on the Candidate List in the event of 100 ppm or more, while the REACH legislation's information obligation requirement is set at 1,000 ppm.
- It is not accepted either for construction products to contain a substance which the EU has included on the priority list of substances with a suspected endocrine disrupting effect (EDs) at a level of 100 ppm or more.
- The revision also introduces a prohibition of carcinogenic, mutagenic and reprotoxic substances (CMR substances in categories 1A and 1B): These are substances of very high concern (SVHC substances) and are defined by the Nordic countries as phase-out substances, i.e. substances that must be phased out of the economic cycle.
- The substances on the negative list in version 2 of the criteria are maintained. Only minor updates have been made. The concentration is also 100 ppm for these.

This entails a degree of duplication for certain substances, but this is necessary since Nordic Ecolabelling generally wishes the limit for the occurrence of hazardous chemical

substances to be set at 100 ppm. The scope may also be broader. Phthalates are an example. The phthalates DEHP and DBP and others are on the Candidate List and are thus already included under the first item. But the term phthalates further down is far broader and prohibits the entire group of phthalates, including those not on the Candidate List.

During the revision, Nordic Ecolabelling investigated the opportunity to also set requirements based on characteristics for construction products/goods, and not just chemical products. For the Swedish industry this would be quite natural and possible, due to the impact of (voluntary) construction element declarations and the construction element assessment system in the market, with a broad impact.[60] The Nordic Swan Ecolabel is a Nordic label, however, and as these systems are not as well-established in other Nordic countries, Nordic Ecolabelling has decided to continue to set requirements based on constituent substances/substance groups, instead of criteria based on characteristics.

Knowledge of the content of a construction product is based completely on what the producer of the construction product adds in production, and what they know of via safety data sheets, product or materials specifications from subsuppliers and suppliers of commodities and materials. A disclaimer text has therefore been added to the appendix to the requirement. See Appendix 9. Even if the item list includes prohibition of the bisphenols A, S and F, this does not entail an automatic prohibition of polycarbonate plastic. The polycarbonate plastic found in entrance ceilings, handrails, edge barriers, corrugated plastic and other products is made from the monomer bisphenol A (BPA). But since in principle all BPA react, the BPA content of the final plastic is very low, often lower than 25 ppm. If any of the calculated construction materials are made from corrugated plastic, Appendix 9 must be completed, but the bisphenol content will probably not be a barrier, as the Nordic Ecolabelling limit is set at 100 ppm.

On 7 September 2016, a time-limited exemption was introduced in requirement O22 concerning brominated flame retardants. Due to several large fires where foam plastic caught fire at construction sites, the industry needs to further reduce the risk of fire. Despite construction-related changes to minimise the fire risk, well-functioning procedures for correct handling and storage of materials and waste, training of employees and good procedures for Hot Work[61], there can still be a need to use flame retardant foam insulation in certain cases.

During the spring of 2016, Nordic Ecolabelling let an independent consultant[62] to investigate the hazard to health and the environment of a new type of brominated copolymers used as flame retardants in EPS and XPS foam. The consultant's conclusion is that the molecules, due to their very high molecular weight, are not as hazardous to health and the environment and with the same risks as HBCD[63] and the other brominated flame retardants which are prohibited or limited.

[60] This concerns the Sunda Hus (Healthy Buildings) and Byggvarubedömningen (building element assessment) systems, as well as the BASTA self-declaration system.
[61] Hot Work is a collective name for work elements which entail heating or spark formation, and which can risk causing fires. This includes welding, cutting, soldering or work using rapid-rotation tools.
[62] Consultant Bertil Krakenberger at Atkins Sverige. Bertil is a civil engineer in chemical engineering. He has worked with the health and environmental risks of chemicals and hazardous waste for 40 years and is a safety adviser concerning hazardous goods.
[63] Hexabromocyclododecane is also abbreviated as HBCDD. This means that there are two different abbreviations for exactly the same brominated flame retardant.

The exemption thus makes it possible to use flame retardant foam insulation with this specific copolymer when the fire risk assessment for a project shows a need for this. The fire risk assessment must be performed by a competent expert and show a medium-high or high risk of fire. The risk can either be at the actual construction site or in the factory producing prefabricated elements/construction elements. Nordic Ecolabelling assesses that the exemption will be relevant for a limited number of projects. The exemption is made after the licensee has requested the exemption in writing and can only be given for a specific project.

On 26 October 2016, an exemption was introduced for residues of unreacted styrene monomers in the insulation materials EPS (expanded polystyrene) and XPS (extruded polystyrene). Insulating panels of mainly EPS are widely used in construction activities. They are used for bases/foundations, roofs and walls, but also in the ground to protect cold-sensitive structures. EPS and XPS are made from polystyrene granulate.

Polystyrene is a polymer comprising styrene monomers. Polymerisation is not complete, so that there are always monomer residues/styrene residues in the polystyrene granulates and also in polystyrene-based products such as EPS/XPS.

European polystyrene manufacturers guarantee that styrene residues in the polystyrene granulates are maximum 1,000 ppm. In contact with several manufacturers of insulation materials, administrators have received information that the styrene content of the raw material varies between approximately 400 and 800 ppm and is normally approximately 500 ppm.

When EPS/XPS insulation material is manufactured, some of the styrene residues are evaporated during the process. This evaporation is strongly affected by the temperature. The storage time also affects the amount of styrene in the end-product, which is the insulation material. According to manufacturers of EPS material, there is no systematic investigation of styrene residues in EPS/XPS material. The production quality parameter which they guarantee is that the styrene content in the polystyrene raw material going into production does not exceed 1,000 ppm (as previously described).

A Finnish manufacturer of EPS insulation material has performed gas chromatographic investigation of styrene residues in newly produced EPS products (blocks and panels). They use gas chromatography to analyse the content of styrene residues. Initially, styrene residues in the raw material, i.e. polystyrene granulate, were 500 ppm. After pre-expansion and moulding, the measurement result was 360 ppm. The amount of styrene residues in the final EPS insulation products was analysed after 1, 2, 7, 14 and 28 days. The result was that during the manufacturing process and four weeks' storage the total amount of styrene residues decreased by 33–40%.

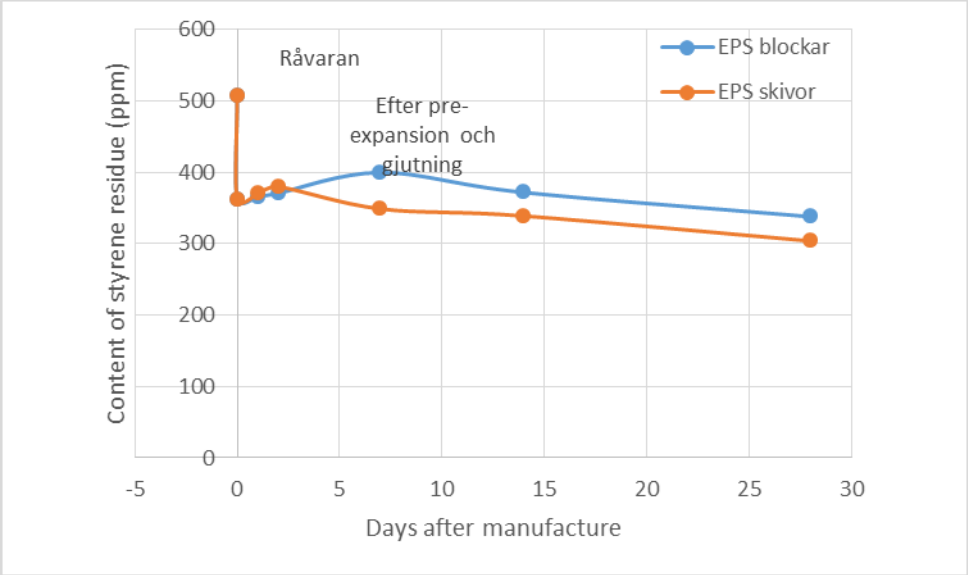


Table explanation: Råvaran=Raw-material, Efter pre-exansion och gjutning=After pre-expansion and moulding, EPS blocker=EPS blocks, EPS skivor=EPS panels

An investigation from September 2016 showing how styrene residues in EPS material decrease after the manufacturing process.

A polystyrene manufacturer estimates that 80-90% of the EPS/XPS insulation material manufactured in Europe is made from polystyrene that is also produced in Europe. Polystyrene produced in China, for example, can, according to the information disclosed, contain up to 3,000 ppm styrene residues.

Styrene is classed, among other things, as Repr. 2 H362d and is also suspected of being an endocrine disruptor. According to Nordic Ecolabelling's definition, styrene in the final product is a contaminant, but since the content in the end-product is >100 ppm, according to our criteria it must be counted as a constituent substance and therefore may not be included.

In summary, requirement O22 is adjusted so that the amount of styrene residues in the polystyrene raw material may not exceed 1,000 ppm. In this way we exclude polystyrene products that are detrimental to health and the environment. Even though the content is normally considerably lower (around 500 ppm) Nordic Ecolabelling has poor steerability to set any other limit since the industry does not sell different batches and uses a common industry standard of 1,000 ppm as the quality measurement. The requirement is verified by the manufacturer of the insulation material (EPS/XPS) ticking the yes or no box.

On 31 January 2018, the ban on brominated flame retardants was adjusted so that electrical cable conduits/ducts may contain specific limited amounts of brominated and chlorinated flame retardants. The content of bromine and chlorine must be verified using the ion chromatography method as specified in EN 14582 or a modified ion chromatography method as specified in EN 50642. The adjustment to the requirement was strongly inspired by the globally developed standard for Halogen Free Material (EN 50642), which reached the final draft stage at the end of 2017. The requirement levels for bromine and chlorine are harmonised in the final draft of EN 50642. But instead of the

standard's total threshold of 0.4% of bromine, chlorine, iodine and fluorine, Nordic Ecolabelling's total threshold is capped at 0.2% of bromine and chlorine together.

The requirement is based on the content of bromine and chlorine in the material itself and is not dependent on whether the cable duct is already filled with cables or not. Nor is the requirement incompatible with the use of PVC cable ducts since they do not need to be flame proofed with brominated flame retardants.

More detailed description of the product groups listed

Table 5: The Table describes the product groups that must verify requirement O22 and what is included or exempted

Product/material and brief description	Covered by requirement O22	Not covered by requirement O22
Fixed sealing products The purpose is to seal from mainly wind and moisture, but also noise and fire. Sealing product is often placed on both sides of the insulation of walls, ground and roof. Sealing products may consist of various materials (cardboard, plastic, fibreglass, etc., often in combination).	Moisture/water barriers, vapour barriers, wind barriers and radon barriers on walls, the ground, basement and ceiling. Wet room panels and fixed sealing layer for wet rooms Jointing strips, tape and similar sealing products used to seal seams, joints, bushings and connections. Form construction materials that remain after casting/moulding.	Roofs irrespective of materials, skylights or smoke vents on roofs.
Interior and exterior building panels May consist of many different materials: cement, fibreglass, gypsum, cardboard and carton, often in combination.	Interior and exterior building panels for roofs, walls and floors. Exterior building panels and roof panels other than solid wood panels.	Wooden panels (solid wood, laminated timber, veneer, plywood, OSB, MDF and chipboard), which instead must fulfil the requirement O14 in chapter 3.
Thermal, acoustic and technical insulation. Intended to avoid heat loss, avoid condensation, dampen noise, etc. Examples of insulation material are mineral wool (stone or glass), cellular plastic, cellulose fibre and light clinker64. The material often contains additives for flameproofing, dust control or mould protection. The insulation material may also be surfaced and coated with substances to achieve a required function.	All thermal and acoustic insulation of walls, roofs and ground/foundation slabs are included, as well as insulation of basements. Technical insulation is, for examples, the insulation of pipes, ducts and shafts.	Building products that are purchased in "finished" state and which contain insulation, such as windows and outer doors. Vibration-dampening webbing that is often used between building elements must not be deemed to be insulation and is exempt from the requirement.
Impregnated wood	Timber that is impregnated as protection from rot, blue stain and mould.	Pre-impregnated construction supplies such as windows and outer doors. Fire protection impregnated timber.
Wood composites A material that is normally a mix of wood fibre/woodmeal and (thermo)plastic (WPC). It is used for façades, boards, outdoor decking/ balconies, fences, etc. The term composite should not be confused with sandwich structure.	Composite wood used to construct Nordic Swan Ecolabelled buildings and related courtyards, play areas or supplementary buildings.	

[64] Often called Leca blocks after the manufacturer Ab Svenska Leca (now part of the Saint-Gobain Group).

Interior covering of plastic for floors, ceilings and walls.	Concerns surface finishes, i.e. what you "walk on and see", Concerns watertight layers, wall film, acoustic dampening foam and other layers under surface finishes. Wet room tapestry is included. Fixed sealing layers are covered by fixed sealing products - see above.	Products in service areas are completely exempt from the requirement. Service areas are fan rooms, substations, lift shafts, machine rooms, electricity centres and other areas to which unauthorised persons do not have access. The following are not service areas: all living areas and communal areas such as dressing rooms, shower rooms, stairways, entrance areas, storerooms, corridors in basements/galleries, pram rooms, and bicycle rooms. Shower walls are not included.
Drainage pipes, heavy current cables, (electrical) conduits and plastic pipes for central vacuum cleaners. The products share in common that the material is plastic - traditional chlorinated plastics (PVC).	Pipes for drain water, pipes for central vacuum cleaners and (electrical) installation pipes, i.e. conduits for electrical wiring. Heavy current cables/electricity cables for nominal voltage equivalent to or more than 50 V AC voltage or 120 V DC voltage. This means that the requirement includes electricity wires/cables for plugs and for apparatus such as fittings with 230 V, white goods, heat pumps, etc.	Products in technical areas are completely exempt from the requirement. Cable ducts are not included as these are normally placed in the ground and thereby fall outside the requirements' scope. The requirement does not include Internet, data, telephony and TV cables. The requirement does not include heating cables, that is cables that produce heat when energized. Plastic products such as palletising trays, plastic spacers, ground spacers, bends, sleeves, mounting boxes, roof boxes, inflow and outflow pipes for white goods, and so on.

O23 Nanoparticles and antibacterial additives in construction products and construction goods

1. Nanoparticles from nanomaterial may not be actively added to the glass on balconies* or on the outer glass surface of windowpanes on windows, window doors and exterior doors. The outer glass pane is in contact with the exterior environment.
2. Chemicals or additives, including nanomaterial** added to provide an antibacterial*** or disinfecting surface may not be used in or on:
   - Floor coverings.****
   - Wall coverings in ceramic material or stone.
   - Kitchen and bathroom fittings such as worktops, splashbacks, cabinet fronts, mirrors and shower walls, kitchen sinks.
   - White goods.
   - Ventilation system regarding the parts in contact with indoor air.
   - Waste disposal units.

** Glass on balconies includes both glass for enclosure/glazing of balconies and glass for railings, guide rails and similar functions.*

*** The definition of nanomaterial follows the European Commission's definition from 18 October 2011 (2011/696/EU).*

**** An antibacterial chemical inhibits or stops growth of microorganisms such as bacteria, fungi or protozoa (single-celled organisms). Silver ions, nano silver, nano gold and nano copper are considered to be antibacterial substances.*

***** The requirement does not include biocide-treated articles/components in white goods, for example air filter and door gaskets. Silver ions, nano silver, nano gold and nano copper are however never allowed in white goods.*

☒ Certificate concerning the occurrence of nanoparticles and antibacterial chemicals in accordance with Appendix 10.

☒ Construction product declaration or corresponding if such is created for the product, as a supplement to Appendix 10.

Background

There is still great uncertainty related to how nanoparticles affect health and the environment[65]. Based on the precautionary principle, Nordic Ecolabelling wishes to take a restrictive approach to the use of nanoparticles and the requirement is based on the environmental consequences when nanoparticles are released to the surroundings (indoor environment or the surrounding environment, seen over the entire life cycle).

Version 2 of the criteria included nano requirement O22 for solid building products and white goods. The requirement prohibited nanometals, nano-carbon compounds and nano-fluorine compounds. In the revision the requirement has been reconsidered and made less general. Nanometals, of which nanosilver is the most important, are instead covered by the term "antibacterials". In its current wording (version 3), the requirement prohibits all antibacterial and disinfecting treatment, and not just nanosilver. Antibacterially treated products are often marketed as preventing bacteria formation, growth and odours. Yet antibacterial treatment is often not needed, and many of its methods must be used with caution, since they can be hazardous to human health and the environment. Antibacterial substances are a type of biocide. Increased use of biocides can lead to bacteria becoming resistant to agents that are actually necessary for hygiene and health in other contexts. One example is triclosan, a chemical with antibacterial properties that is used as a preservative and antibacterial agent. The Norwegian Environmental and Children's Asthma Study (MBA study) showed a link between measured levels of triclosan in children's urine samples and rhinoconjunctivitis and allergic sensitisation. The same link has been shown in the American National Health and Nutrition Examination Survey (NHANES). More nano background information can be found in Appendix 10.

The prohibition of nano-carbon compounds has been removed as it is not deemed to be relevant. It was added to version 2 of the criteria in order to prohibit synthetic nano-carbon tubes that are mainly used in the electronics industry.

Nano-fluorine is covered by requirement O22, which prohibits perfluorinated and polyfluorinated alkylated substances. This has been assessed to be sufficient and nano-fluorine has therefore been removed on revision.

Waste disposal units have been added as a product covered by the nano-requirement. There are waste disposal units in the market that on manufacture are provided with silver as antibacterial protection, often by silver ions. Silver ions are highly toxic for both the

[65] European Council, Recommendation 2017 (2013), Provisional version, Nanotechnology: balancing benefits and risks to public health and the environment. Available on page: (21/5-13).

bacteria in wastewater treatment plants and aquatic organisms in our watercourses and there are concerns that widespread use of silver as an antibacterial agent may contribute to the development of silver-resistant bacteria. The product groups are otherwise the same. Exactly as in version 2, the requirement must be fulfilled by floors, white goods and ventilation systems with regard to the elements that are in contact with the indoor air, such as supply air vents and ventilation ducts. Just as before, the requirement also includes fixtures. This includes worktops (in kitchens, wet rooms, windowsills and other fixed counters mounted in the building before it is taken into use), splashbacks, cabinet doors, mirrors and shower walls.

For windows the requirement has been extended to prohibit all nanoparticles on outer glass panes and not just nano-metals, nano-carbon compounds and nano-fluorine as before.

After the consultation, information has been received that the TiO_2-based self-cleaning surfaces Pilkington Active from Pilkington and Bioclean from Saint-Gobain do not consist of nanoparticles,[66,67]but are considered to be nanostructured materials in accordance with the definition in the ISO 80004-4 standard[68]. According to Saint-Gobain, the surface will be defined as an item in accordance with REACH. The self-cleaning surfaces consist of a continuous film of polycrystals on the glass and are not built up from individual nanoparticles, according to the manufacturers. According to Saint-Gobain, the surface consists of TiO_2 in rutile crystalline phase and comprises 40 mg/m^2 glass. This surface will affect the window's g-value to a small degree and will reduce the g-value by 1-2 units, according to Saint-Gobain. According to Saint-Gobain, a new European standard, EN 1096-5, for testing of windows' self-cleaning properties, will soon be launched. Note that this test will not include the surface's function over time.

According to Saint-Gobain, there are three different methods to attach TiO_2-based surfaces to windows. The first two methods are CVD (chemical vapour deposition) and magnetic spraying, which takes place at the glass production site. The last method is a spray deposit of a mixture containing nanoparticles. This method can be performed on the glass after the installation of the actual window, or after inserting the window in a façade.

In the requirement, it is not permitted to actively add nanoparticles from nanomaterials to a glass surface. According to the above description, this requirement will not include self-cleaning surfaces added by CVD and magnetic spraying, so that the self-cleaning surfaces Pilkington Active and Bioclean can be used in Nordic Swan Ecolabelled buildings. Self-cleaning windows that are produced by spray deposits cannot be include in Nordic Swan Ecolabelled buildings, however. The requirement is not changed after the consultation.

The aim with the requirement is to prohibit surface treatment of the whitegoods, normally done with silver ions and/or triclosan. The aim has never been to put requirement on individual components such as door gaskets and air filters or sealants that might contain biocides/fungicides. The requirement has been clarified.

[66] E-mail correspondence with Pilkington Sweden, November 2015.
[67] E-mail correspondence with Saint-Gobain, January 2016.
[68] ISO/TS 80004-4:2011 Nanotechnologies -- Vocabulary -- Part 4: Nanostructured materials

In version 3.9, a clarification has been introduced that the kitchen sink is covered by the requirement. The requirement includes, among other things, kitchen fittings to which the kitchen sink belongs.

O24 Surface layers on floors, ceilings and walls

Interior surface layers on floors, ceilings and walls may not contain chlorinated plastics (PVC). Other interior surface products in PVC are comprised, such as moldings, skirting, baseboards and interior doors.

Service areas are exempt from the requirement. Service areas are fan rooms, substations, lift shafts, machine rooms, electricity centres and other areas to which unauthorised persons do not have access.

Watertight layers, wall film, acoustic dampening foam and other surfacing under surface finishes are not subject to the requirement.

PVC moldings next to sauna doors are exempted from the requirement.

PVDC (polyvinylidene chloride) is a type of chlorinated plastic (PVC) that is not permitted either.

✉ Documentation to show how the requirement is fulfilled, for example product data sheet, construction product declaration or similar.

Background

The requirement covers both vinyl flooring and flooring which includes PVC and/or PVDC as a material/component. The latter may involve cork flooring coated with a thin outer layer of PVC or textile flooring with a PVC backing. This scope is the same as in the criteria for Nordic Swan Ecolabelled floors. The requirement also includes surface layers/finishes in PVC that are designed for walls and roofs. So as not to limit the opportunities to use approved **watertight layers** in wet rooms, the requirement solely concerns the **surface** layer, which is what you "see and walk on".

PVC has long been in focus in the environmental debate. Some of the environmental problems with PVC are due to the molecule itself – or more precisely the chlorine in the actual PVC molecule. In other cases, the problems concern additives in the PVC which are harmful to health and the environment. The latter environmental problem may be easier to tackle using greener alternatives. Just as in the version 2 criteria, Nordic Ecolabelling does not permit PVC in watertight layers on floors, ceilings or walls. The most important reasons for this are:

- The environmental problems caused by PVC manufacture, primarily where the mercury method is used to produce chlorine gas from salt (NaCl). Despite major reductions in emissions, mercury is still emitted to water and air.
- It is difficult to achieve complete traceability regarding where the PVC has been manufactured. One reason is that many manufacturers balance out too much and too little dichloroethane (EDC) and vinyl chloride monomers (VCM) between different manufacturing sites. EDC and VCM produced from chlorine manufactured using the mercury method and the membrane method, respectively, are thus mixed. Hardly any manufacturers can deliver PVC guaranteed, with full traceability, not to have been manufactured using the mercury method in any respect.
- Used PVC flooring incinerated in waste incineration plants is associated with difficulties. Large amounts of neutralising lime must be added to protect the equipment and to keep emissions within the limit values. The amounts of flue gas cleaning residues increase. The amount of flue gas residues formed depends on the type of cleaning equipment installed. The plant needs to be halted several

times a year. This increases the costs of actual incineration and for handling the residual product, which is classified as hazardous waste.

- Not all the Nordic countries allow incineration of used PVC. Denmark has waste legislation which states that all PVC must first be sorted for material recycling. As this does not exist in practice for vinyl flooring, used vinyl flooring ends up in landfill.

On 9 November 2017, the Nordic Ecolabelling Board decided to clarify that the ban on interior surface layers in PVC in Requirement O24 also applies to interior surface layer products such as mouldings, doors, skirtings and interior doors. The intention has been to ban PVC in a broader perspective, althought the products have not been listed in the requirement.

The change is valid for new applications and applications on projects after the date of descision (November 9, 2017).

On 17 November 2020, it was decided to introduce an exemption for PVC in moldings at sauna doors. A number of licensees have announced that they had to replace moldings on sauna doors prematurely when they started to show signs of mold. They have also found it difficult to find an alternative molding that meets the desired function and quality.

O25 Windows and exterior doors in non-renewable materials

Windows and exterior doors* made from non-renewable materials must comprise a certain proportion of recycled** material, as follows:

- At least 40% of the aluminium in profiles or door leaves must be recycled aluminium.
- At least 30% of the PVC in profiles or door leaves must be recycled PVC.
- At least 20 % of the steel in profiles or door leaves must be recycled steel. Stainless steel is not permitted.

Recycled plastic resources may not contain lead or cadmium in levels exceeding 100 ppm**. Plastic items ≤ 50 grams are excluded.

The requirement concerning the proportion of recycled material does not apply to:

- external cladding of outer wood components for the sole purpose of weather proofing
- (plastic) composite material
- materials that account for less than 3% by weight of the window's, window door's or outer door's total weight
- hinges, handles, fittings, stabiliser plates and kick plates
- window and outer door insulation
- non-renewable components in glass panes/insulation panes.

A Nordic Swan Ecolabelled window, window door and outer door will fulfil the requirement and must only verify the requirement with product name and licence number.

** Windows and exterior doors cover products between an outdoor climate and an indoor climate pursuant to standard EN 14351-1:2006. This means fixed and opening facade and roof windows, window doors and external doors. Even other types of exterior doors that can be subject to various function requirements are include, for example hallway doors, loft space doors, warm store doors, cold store doors and various gates. Entrance portions are also comprised.*

Lantern lights regulated by product standard EN 1873, and windows and exterior doors that are resistant to fire pursuant to standard EN 16034 are not included in the requirement.

*** Recycled material is defined as recycled material both from the pre-consumer phase and the post-consumer phase, in accordance with ISO 14021:*

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

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

☒ Specification of the proportion of recycled material used, for example in a construction product declaration. Declaration from the material supplier on the share of recycled material on an annual basis, in accordance with Appendix 11.

☒ For recycled plastic, also test results or the equivalent showing that the requirement concerning lead and cadmium is fulfilled in accordance with Appendix 11.

Background

The requirement has been harmonised with equivalent requirements in the criteria for Nordic Swan Ecolabelled windows and exterior doors. In principle the requirement level is the same as in version 2. 30% recycled plastic material was also required previously. The requirement concerning the proportion of recycled material has now also been determined for other materials than plastic.

The single most significant contribution to a window's overall environmental impact is related to the window's energy utilisation when it is used, i.e. during operation of the building. Almost 5,000 MJ may be lost over the course of the utilisation phase, which is assumed to be 30 years. It is therefore important to select windows and outer doors that insulate well against heat loss, i.e. have a low U value. This property is handled in the Nordic Ecolabelling requirement of the building's energy use, O4.

In the Nordic market, wood is extensively used for windows and exterior doors. Wooden windows may be covered externally with a weatherproofing profile, normally aluminium (or other material), to increase durability and reduce the window's maintenance requirement. Even though wood and wood/aluminium are the dominant materials used for windows and door profiles, other materials such as PVC, composite and steel are also used. PVC is used for both windows and exterior doors and is marketed as maintenance-free. Plastic composite material is a relatively new material for windows and door profiles. By plastic composite material is meant a profile material consisting of fibreglass-reinforced plastic material (often polyester) and not that the window consists of several different materials/panels (sandwich element).

There is great variation in energy consumption for windows of different materials. Manufacturing 100% wooden windows uses the least energy, while a window made entirely in aluminium uses considerably more energy and there are other options in between[69]. To handle these energy consumption variations Nordic Ecolabelling requires a certain ratio of recycled material. The requirement is fully harmonised with equivalent requirements in

[69] LEED, Study of points given for PVC in LEED Green Buildings and A study from the University of Bath, UK, summarising data for construction materials in the report "Inventory of Carbon & Energy (ICE)", Version 2.0, 2011.

the criteria for Nordic Swan Ecolabelled windows and exterior doors, version 4.0 from March 2014. This means that both pre-and post-consumer material may be used to calculate the proportion of recycled material. On the other hand, it is not acceptable to include production waste from the manufacture of window and door profiles, i.e. own production waste. The requirement concerning the proportion of recycled content must, as a minimum, be verified on an annual basis by the supplier of the material.

A number of exemptions are listed in the requirement. Plastic composite material is manufactured from hard plastic, which impedes recycling, and for quality reasons it is currently not possible to use recycled fibreglass. Recycled resources may not be required either for the insulation in windows and outer doors that is often a polymer, such as polyurethane.

Recycled PVC may currently contain lead, cadmium and other undesirable substances. This means that products made from recycled PVC cannot guarantee levels that are acceptable in health and environmental terms. The principle of high and similar requirements concerning the content of hazardous substances in newly produced and recycled materials is important for Nordic Ecolabelling. Cadmium and lead must be removed from the ecocycle before recycling can be rewarded. There must also be no risk that ecolabelled windows and outer doors may be labelled with the cadmium symbol for recycled PVC. Nordic Ecolabelling therefore sets the requirement that the recycled plastic (raw material) may not contain levels of lead and cadmium exceeding 100 ppm, which is also in harmony with the criteria for Nordic Swan Ecolabelled windows and exterior doors.

Stainless steel is the most important speciality steel, accounting for around 2% of the total volume of steel in the world. The stainless characteristic is achieved by adding substances such as chromium (Cr) and molybdenum (Mo). Stainless steel is most commonly an alloy with at least 7-18% Cr. Nickel (Ni) is added to make steel more workable, usually at a level of around 8%. Stainless steel has more than double the embodied energy. The additives are primarily chromium and nickel, and the energy consumption involved in making it means that stainless steel is worse in environmental terms than ordinary steel (carbon steel). Nordic Ecolabelling does not want stainless steel to be used as a material in door leaves.

In this criteria document, windows and exterior doors are:

- Windows and exterior doors between free and constantly heated areas, i.e. between the interior climate and exterior climate products according to the EN 14351-1 standard: 2006. This means fixed openable façade and roof windows, window doors (e.g. balcony and terrace doors) and outer doors.
- Other types of exterior doors of which various function requirements are made, e.g. entry hall doors/apartment doors, exterior corridor doors, warm storage room doors, cold storage room doors and various gates.

On the other hand, this does not include dome ceilings (skylights) [70], which are regulated by product standard EN 1873, nor windows and exterior doors that are resistant to fire under standard EN 16034.

[70] Dome ceilings are installed on flat or almost flat roofs, but otherwise fulfil many of the functions of a "normal" window.

In the autumn of 2017, Nordic Ecolabelling examined the requirement for profiles and door leaves to contain at least 30% recycled aluminium to ascertain how well it is working. Our requirements define recycled material as post-consumer material, waste material/scrap from the manufacture of windows, external doors and façade components, and other industrial scrap, e.g. from cable production. However, Nordic Ecolabelling does not include production waste from the manufacture of windows and door profiles in the percentage of recycled material.

Through dialogue with a world-leading manufacturer of extruded aluminium/profiles[71], Nordic Ecolabelling has identified the following:

- The manufacturer of profiles uses ingots of primary (virgin) aluminium and recycled aluminium. In 2016, 45-50% of the annual volume came from recycled aluminium.
- Recycled aluminium consists of scrap from its own manufacturing processes and processing scrap purchased from customers and competitors. Scrap from consumer waste is not used. The reason is that aluminium was introduced as a construction material only relatively recently. It also has a long life. The availability of post-consumer aluminium is therefore very low and, at present, is not economically attractive.
- Some of the processing scrap that the manufacturer purchases from customers and competitors comes from other profile manufacturers that do not have smelting facilities of their own. According to Nordic Ecolabelling's definition, this fraction could also probably be discounted. That would only leave the scrap purchased from manufacturers of windows, doors, entrance ways and façade components. Sapa estimates this fraction to be significantly lower than 45%, but it does not have exact figures for this.
- The manufacturer does not have a system for separating its own processing scrap (scrap from its own production of profiles) from the annual volume.
- Extruded material (aluminium) cannot be recycled within its own process. This means that extrusion scrap goes into the re-smelting process and is not returned to its own process. The conclusion is that this material from the profile manufacturer's own extrusion process and the material it purchases from competitors that do not have smelting facilities of their own is material from the pre-consumer phase as defined in ISO 14021.

The investigation resulted in the following adjustment to the requirement on 10 January 2018:

1. The percentage of recycled aluminium is increased from 30% to 40% on an annual basis since the text adjustment is of great importance to the amount of recycled aluminium. Since there is no equivalent correlation for PVC and steel, these percentage rates have not been changed.
2. An adjustment to the definition of what qualifies as recycled material. After the adjustment, we can align ourselves fully with the definition of recycled pre-consumer material as stated in ISO 14021. But to ensure greater clarity and harmonisation, we have also added "Nordic Ecolabelling defines..."

[71] Sapa Profiles is now a business area of Hydro and is called Extruded Solutions.

O26 Copper in domestic water pipes and as façade and roofing material

Domestic water pipes may not be made of copper. The exception is visible pipe laying/pipework, water fittings' connecting pipes and domestic water pipes in service areas. Service areas are substations, machine rooms, electricity centers and similar areas. Tap water chutes are not included in the exception.

Cladding for roofs and façades and products for roofs and façades may not have a copper content of more than 10% by weight.

Closed water piping systems such as water-borne heating systems are not covered by the requirement.

Roof and façade products e.g. include roof dewatering products, guttering, exhaust air hoods, eaves netting and roofing profiles.

✉ Documentation to show that the requirement is fulfilled.

Background

Copper's environmental impacts

Copper is an essential (vital) metal, but is nonetheless toxic for, primarily, phytoplankton, shellfish, mussels and fish. Phytoplankton is extremely sensitive to copper and inhibited growth has been measured in extremely low concentrations of free copper ions. Copper is one of the comparatively most toxic metals for aquatic organisms.[72]

Dominant sources of copper for water recipients and wastewater treatment plants are domestic water (due to the copper pipes), at approximately 4,000 kg/year and vehicle traffic, at approximately 4,000 kg/year. Buildings with copper panels contribute approximately 1,200 kg/year[73]. A large share of the copper which reaches treatment plants via the drainage network is embedded in the sludge, and approximately 60-80% of the copper passing into the treatment plants originates from buildings' domestic water pipes. With regard to sludge, the long-term trend is to reduce the metal content. Unfortunately, copper and zinc are exempt from this positive development. The long-term trend for copper and zinc in sewage sludge has not been reduced, and the copper content is still increasing. One reason is that to a great extent copper is built into the infrastructure and it is therefore not so easy to reduce the addition of copper as for e.g. mercury and silver.

In its report on "Hållbar återföring av fosfor" (Sustainable phosphorus recycling) from September 2013[74], the Swedish Environmental Protection Agency notes that the copper content found in farmland does not show negative microbiological effects, but that the margin is small. The actual background copper content as a local factor varies across the country. To give general protection from the effects of copper, stricter requirements concerning copper from sludge recirculation are therefore justified. The Swedish Environmental Protection Agency furthermore notes specifically that the addition of copper must be reduced, so that sludge can be recirculated on a sustainable long-term basis. For copper, silver and zinc, the Swedish Environmental Protection Agency cannot set thresholds which are as low as would be necessary for Sweden to have no long-term accumulation in farmland by 2030. The Agency's proposed threshold is a compromise between the requirement of development towards a non-toxic environment, and business operators' requirement of a longer time frame for any transition. In summary, it is

[72] Koppar i Stockholms vattenområden (Copper in Stockholm's aquatic areas), Hans Borg, ITM, Stockholm University.
[73] Koppar i Stockholms vattenområden (Copper in Stockholm's aquatic areas), Hans Borg, ITM, Stockholm University.
[74] Sustainable phosphorus recycling - Swedish Environmental Protection Agency's report in response to an assignment from the government, Report 6580, 2013.

relevant to also limit the spread of copper as a material in domestic water pipes and from copper panels such as construction materials.

Another environmental aspect is that copper is in limited supply. New studies show that a rather optimistic prediction is that there is enough copper until 2075, while also taking account of population growth and the increased use of copper due to higher standards of living. However, the study also considers the drawbacks of copper extraction75. High standards of living will also increase the focus on the consequences of production. These include energy and water consumption, pollution and problems for local communities. On the positive side, copper is already the third most often reused metal (approximately 50%).

Copper in domestic water pipes
As stated above, copper in water pipes can be the dominant source of copper spread to treatment plants. The Swedish Water & Wastewater Association states that 75% of the volume of copper to Swedish treatment plants is from homes' domestic water systems.

The material used in domestic water systems for new production varies between the Nordic countries and between projects, according to construction techniques, etc. Besides such metals as copper, stainless steel and brass, often polymer materials (PEX, polypropylene, polybutylene, etc.) are used. Alu-PEX is a common material that is a mix of an interior and exterior polymer layer and an intermediate aluminium layer. On selecting pipework material, several aspects must be considered such as lifetime, maintenance and technology, as well as finances. In order to ensure well-balanced decisions on selecting pipe material, but also to reduce the addition of copper to the environment, copper is not permitted as a domestic water pipe material in Nordic Swan Ecolabelled buildings. The requirement does not apply to closed water piping systems, as the water circulates in these.

The exception from the general rule is connecting pipes to the water fittings, often of a few decimetres in length and made from copper. Another relevant exception is visible piping, which is often the case in wet rooms in e.g. Sweden.

In October 2017 another exception was introduced. During the application process it had become clear that it was necessary with domestic water pipes in copper in service areas such as boiler rooms, substations, machine rooms, electricity centres and similar areas. The cause is that it's maintenance continuously is performed in these installations and pipes need to be soldered and welded which require copper as material.

At the same time, it is clarified that the exception does not imply to tap water chutes. The reason to this is that alternative materials to copper works well in tap water chutes.

Copper as a material for façades and roofs
Copper is an exclusive material and is used as roofing or façade material mainly on cultural buildings, museums and so on, and in the restoration of historical cultural buildings. During the revision we found a number of (not Nordic Swan Ecolabelled) projects in which both small houses and apartment buildings were newly produced, using copper as the material for façades and/or roofs.

[75] http://inside.mines.edu/UserFiles/File/economicsBusiness/Misc%20PDFs/Copper-Science-2014-Kerr-722-4.pdf.

The requirement has to be relevant, been extended to comprise products for façades and roofs like roof dewatering products, guttering, exhaust air hoods, eaves netting, roofing profiles and similar products.

Lead is removed from the requirement
The use of lead in products has decreased strongly due to legislation in various areas. Lead is still used in certain specific areas of application where alternatives have been difficult to find, such as accumulators, ammunition, fishing weights, radiation protection, electronics and boat keels. The use of lead in plastic has in principle been discontinued, due to the transition to other stabilisers. The use of lead in paint has decreased to one tenth in the course of a decade. Today, mainly anticorrosive paint contains lead (red lead).[76].

In the background to version 2 of the criteria it was found that lead in roof and façade cladding was previously one of the largest areas of application for lead in Denmark. But according to Danish legislation, there is a general prohibition on importing and selling products containing lead or lead compounds. Similar phasing-out has taken place in other Nordic countries, and within the EU. On this basis there does not seem to be any reason to maintain a specific requirement that façades and roof cladding must be free of lead. It should be noted that lead and lead compounds are prohibited in the applications governed by requirements O20 and O22.

5.7.4 Timber, bamboo and fibre materials

Introduction to forest requirements

Nordic Ecolabelling wants to contribute to sustainable forestry (ecologically, economically and socially). From a life cycle perspective, forestry is a key part of the wood product's environmental impact, and it is important that the renewable raw material is grown/used in a sustainable way.

Sustainably managed forests deliver a wealth of benefits for society, beyond the wood for materials and energy. The forests slow global warming by capturing and storing CO_2, they provide daily necessities for local communities and indigenous peoples, ensure biodiversity (wild animals and plants), protect water and soil from pollution and erosion, and so on. Preservation or improvement of these forest characteristic are all elements in sustainable forest management, and Nordic Ecolabelling wishes to promote this by setting requirement to sustainable wood.

It is also often environmentally beneficial and a good climate strategy to promote the use of wood from sustainably managed forests, rather than using other less environmentally and CO_2 intensive materials such as steel, aluminium or concrete.

Using wood from sustainably managed forests will also create the incentive to preserve and continue to develop forests in a sustainable manner for the benefit of future generations. Sustainable management may also imply that parts of the areas are being protected against interference. The alternative, as seen in many places and frequently in tropical areas, may be that forests are cleared for other uses. This could be mining or various forms of agriculture such as cattle grazing or cultivation of soy, corn, palm oil, sugar cane, coffee or cocoa, etc.

[76] Chemicals inspection, facts about lead.

Forests can also be gradually impoverished, if the exploitation is not sustainable, e.g. if the amount of timber persistently harvested exceeds the annual growth. It can lead to increased CO_2 emissions that increase global warming and may also harm the forest's biodiversity. Non-sustainable forest management may also consist of a breach of terms regarding forest workers, small communities, or indigenous people who live in dependence on forests. Using wood that is not documentable sustainable, may risk stimulating such effects.

Therefore, Nordic Ecolabelling requires that wood raw materials used in Nordic Swan Ecolabelled products have to come from sustainable forestry through requirements to traceability and certification. Nordic Ecolabelling has not developed its own requirements for sustainable forestry but has instead opted to require that wood material must comply with existing forestry and certification standards. Nordic Ecolabelling also wants to prevent the use of endangered tree species and tree species from vulnerable areas. Nordic Ecolabelling has prepared a list of tree species, which is not permitted to be use in Nordic Swan Ecolabelled products.

What do the requirement comprise?

The requirements in this chapter comprise the Nordic Swan Ecolabelled building, but also for any supplementary building (i.e. refuse depots, bicycle storage rooms and sheds) and decking, fences, outdoor furniture, playground equipment and similar items that is included in the Nordic Swan Ecolabelled project/assignment and constructed together with and marketed with the Nordic Swan Ecolabelled building.

O27 Tree species not permitted to be used in Nordic Swan Ecolabelled buildings

Tree species listed on Nordic Ecolabelling's list of prohibited tree species (see www.nordic-ecolabel.org/wood/) are not permitted to be used in Nordic Swan Ecolabelled buildings.

Unlike the rest of the requirements in this chapter, timber and wood products used in construction but not incorporated in the building, for example wood in casing and mold is covered by this requirement.

✉ Declaration from the applicant that the requirement to tree species not permitted to be used in Nordic Swan Ecolabelled building is met. Appendix 12 shall be used.

Background

Nordic Ecolabelling requires that a number of tree species be not permitted to be used in Nordic Swan Ecolabelled small houses, apartment buildings and buildings for pre-schools and schools. The requirement applies only to virgin forest tree species and not tree species defined as recycled material (definition of recycled material, see the requirements for wood raw material O28).

The list of prohibited tree species is based on the wood species that are relevant to Nordic Ecolabelling's criteria, i.e., tree species that have the potential to be included in Nordic Swan Ecolabelled products. Listed tree species are indicated by the scientific name and the most common trade names. The scientific name/trade name is not always adequate, as there may be more than one scientific name/trade names for the listed tree species than the list indicates. From a precautionary approach, closely related or similar tree species are included in the list.

Criteria for tree species found in the list are wood originating from:

- IUCN red list, categorized as critically endangered (CR), endangered (EN), vulnerable (VU) and relevant species as Near Threatened (NT).
- Tree species list CITES Appendices I, II and III.
- Non-sustainable forestry, such as tree from HCVF, IFL -areas in countries/regions with high corruption.

IUCN Red Lists[77] are the world's most comprehensive inventory of the global conservation status of the planet's biological species, including trees. IUCN Red List has established clear criteria to assess the risk of extinction among thousands of species and subspecies. These criteria cover all countries and all species in the world. Nordic Ecolabelling wishes to prohibit tree species listed as endangered (categories CR, EN and VU) and few tree species listed as NT, in the cases where IUCN Red List indicate the scientific family name and "spp" indicating that there are more tree species.

A large proportion of tree species (except for six species) listed on the IUCN Red List, categorized as CR, EN and VU, is also listed on CITES[78]. CITES is an international convention for the control of trade (across borders) of wild fauna and flora. CITES includes around 5600 animal species and around 28.000 plant species wherein a part is relevant timber tree species (mainly tropical species). The tree species is, dependent on how threatened they are, listed in Appendix I, II or III. Species listed in Appendix I, are highly endangered and trade with these species is totally banned. For the remaining tree species, special permits for import and export is required (Appendices II and III). CITES is regulated by EU legislation (Council Regulation (EC) No 338/97) and trees with valid CITES permits are considered to be legally harvested under EUTR. Nordic Ecolabelling's ban on the use of tree species listed in CITES (Appendix I, II or III) goes beyond the EU legislation.

There may also be other tree species, not covered by the IUCN Red Lists, or CITES, that Nordic Ecolabelling nevertheless believes may be relevant to prohibit in Nordic Swan Ecolabelled products, due to the risk of unsustainable forest management despite forest certification. This could be the case regarding Siberian larch. Siberian larch is a coveted tree species in the construction industry due to its high quality. The tree species is widespread in the boreal climate zone. In Russia, there are large contiguous forest areas, which are largely untouched by humans, so-called "Intact forest landscape (IFL)"[79]. These forests are threatened by logging and infrastructure[80]. Corruption in Russia is also a major issue, as evidenced by the Transparency International Corruption Perceptions Index (CPI)[81]. Siberian larch, and particularly the species Larix sibirica, Larix gmelinii, Larix cajanderi and Larix sukaczewii, are widespread in these so-called IFL areas in Russia.

There has in recent years been an increasing focus on the legality and sustainability of the European imports of timber, especially from tropical countries and countries with high corruption. Environmental organizations have shed light on problems in connection with trade and consumption of endangered wood species and wood from sensitive forest areas. Organizations and consumers concerns have been that consumption of wood contributes to the extinction of species or the destruction of forests and other unique

[77] http://www.iucnredlist.org/
[78] https://www.cites.org/sites/default/files/eng/com/pc/19/e19-11-05.pdf, visited 20. October 2015
[79] Aksenov mfl. 2002. Atlas of Russia's Intact Forest Landscapes. Global Forest Watch Rusia.
[80] http://www.worldwildlife.org/ecoregions/pa0601> (visited 2015-09-14)
[81] http://www.transparency.org/cpi2014 (visited 2015-09-14)

forest areas. A recent study[82] of the extent of illegal logging estimates that illegal logging represents 50-90% of all logged wood in important tropical producer countries and 15-30% globally. Because of the extent of illegal logging, the EU adopted a law, the EU Timber Regulation (995/2010/EG)[83], which prohibits marketing and sale of illegal timber in the EU. This applies to imported wood, as well as wood harvested in the EU. The regulation came into force on 3 March 2013. The EU Timber Regulation, or simply EUTR, foresees obligations for all operators who handle timber or timber products on the European market. The aim of EUTR is to combat illegal logging and prevent trade with illegally harvested timber. Illegal logging contributes several places in the world to unsustainable forestry e.g. deforestation, forest degradation and major secondary effects such as loss of biodiversity.

Nordic Ecolabelling is positive towards EUTRs focus on combating illegal logging but is also aware of the challenges in protecting endangered tree species and wood from sensitive forest areas, so-called HCVF (High Conservation Value Forestry) such as hotspots of high biodiversity (e.g. rainforest) or IFL (Intact Forest Landscape). Preservation of rainforests is also a central theme in the UN climate negotiations when it comes to regulating the earth's climate. Several reports show for example, that the Amazon plays an important role in precipitation patterns and temperature elsewhere in the world[84, 85, 86]. Deforestation in the Amazon can for example lead to drought in the United States and floods in Norway.

The list of prohibited tree species is located on www.nordic-ecolabeling.org/wood/. The requirement must be documented by a declaration from the applicant stating that tree species not permitted to be used in Nordic Swan Ecolabelled product are met. Annex 12 may be used. Nordic Ecolabelling may demand more documentation for a specific tree species.

It has been seen that tropical hardwoods are used in formwork in housing construction. The Norwegian rain forest foundation's website states that teak and meranti, among others, are used in plywood for formwork/moulds. This means that raw wood used in the construction stage is also subject to requirement O27. Normally, the material requirement only applies to what is built into the Nordic Swan Ecolabelled building.

O28 Wood raw material

This requirement applies to the following constructions elements of solid wood, bamboo or plywood/veneer:

- roof trusses
- frames and joists as well as curtain walls and underlay on roofs
- interior panels
- exterior façades
- timber for balcony, terrace, decking and veranda

[82] Nellemann, C., INTERPOL Environmental Crime Programme (eds). 2012. Green Carbon, Black Trade: Illegal Logging, Tax Fraud and Laundering in the Worlds Tropical Forests. A Rapid Response Assessment. United Nations Environment Programme
[83] http://ec.europa.eu/environment/forests/timber_regulation.htm
[84] Nobre AD, 2014, The Future Climate of Amazonia, Scientific Assessment Report. Sponsored by CCST-INPE, INPA and ARA. São José dosCampos, Brazil, 42p.
[85] http://news.mongabay.com/2014/12/tropical-deforestation-could-disrupt-rainfall-globally/
[86] Medvigy. et al, 2013, Simulated Changes in Northwest U.S. Climate in Response to Amazon Deforestation, J. Climate, 26, 9115–9136.

The license applicant may of course include other building parts (such as flooring or building boards) in the calculation of certified timber.

Nordic Swan Ecolabelled wood products are considered as wood from certified forests.

Name of species

The applicant must state the name (species name) on the wood raw material used in Nordic Swan Ecolabelled buildings.

Chain of Custody certification

The supplier of wood raw materials must be Chain of Custody certified by the FSC/PEFC schemes.

Suppliers who only deliver recycled material in the Nordic Swan Ecolabelled buildings are exempted from the requirement to Chain of Custody certification. For definition of recycled material, see below.

As an exception from the general rule, a non-Chain of Custody-certified supplier (for example a joinery) to the license applicant, can be approved, provided that the supplier can guarantee that the wood raw material is purchased from a Chain of Custody certified wood raw material supplier which can prove that the wood raw material fulfills the Nordic Ecolabelling requirement.

Certified wood raw material

A minimum of 70% by weight of all wood raw material used in the Nordic Swan Ecolabelled buildings, must origin from forestry certified under the FSC or PEFC schemes or be recycled material.

The remaining proportion of wood raw material must be covered by the FSC/PEFC control schemes or be recycled material*.

The requirement must be documented as purchased amount of wood on a project basis.

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

Pre-consumer material: Material diverted from the waste stream during a manufacturing process. Excluded is reutilization of materials such as rework, regrind or scrap generated in a process and capable of being reclaimed within the same process that generated it.

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

Nordic Ecolabelling considers products from primary wood processing industries (sawdust, wood chips, bark, etc.) or residues from forestry (bark, branches, roots, etc.) as recycled material.

☒ Name (species name) on the wood raw material used in the construction parts in the bullet list in the requirement.

☒ Valid FSC/PEFC Chain of Custody certificate from all suppliers covering all wood raw materials. (Exempted from this requirement are suppliers who only deliver recycled material).

☒ Documentation showing that the quantity of certified wood raw material or recycled material is met with a calculation of the total purchased amounts on a project basis. Amount can be reported as purchased volume or weight, but the units may not be combined in the statement. The requirement applies to either per construction element or in total for the listed elements. A copy of invoice(s) to confirm the proportion of certified timber purchased for the building/project. If a construction product is labelled with the FSC- or PEFC-logo (logo licence product) it automatically fulfills the requirement and is documented with a photography /image. Appendix 12b can be used.

✉ In the exceptions when the licence applicant has a non-Chain of Custody certified supplier, the supplier shall present invoice(s) for the current wood raw material from the Chain of Custody certified supplier and the valid certification which must be in accordance with the invoice(s). The invoice must state volume certified wood raw material. The licence applicant must have a documented agreement with the supplier which describes how the supplier guarantees that the specified, certified wood raw material on the invoice is delivered to the applicant. The agreement shall also include that the supplier is obliged to report to the applicant if the wood raw material supplier is exchanged. Nordic Ecolabelling can ask for further information.

Background

Name of the wood raw material

Nordic Ecolabelling sets requirements to gain information about which tree species are used in Nordic Swan Ecolabelled products. The requirement makes it possible to control the Change of Custody certificates in the supply chain (check whether the stated tree species is covered by the Chain of Custody certificate) as well as provide information for future forest requirements. If recycled material is used in the Nordic Swan Ecolabelled building, and particularly in the form of recirculated fiber, it is not always possible to specify the name (species name) of all wood raw materials used. In this case, the requirement for documentation of recycled material is to be met.

FSC, PEFC and EUTR

Forest Stewardship Council (FSC) and Programme for the endorsement of Forest Certification schemes (PEFC) cover together 98% of the world total certified sustainable managed forest area[87], and are predominant in the global market for certified sustainable wood. Both schemes cover Forest Management certification of forests and subsequent Chain of Custody (CoC) certification, which documents the traceability of timber and timber products from certified forests. Both systems are considered common among forest owners, forest industries, manufacturers and distributors of wood products, and public authorities as reliable systems for sustainable forestry.

FSC updated traceability standard from 2015[88] and PEFCs traceability standard from 2013[89] fully meets the requirements of EU Timber Regulation (995/2010/EC)[90] prohibiting the marketing and sale of illegal timber in the EU. This applies to imported wood, as well as wood harvested in the EU. Nordic Ecolabelling recognizes both the FSC and PEFC as schemes that provide sufficient guarantees for legal and sustainable forestry.

Traceability Certification

Nordic Ecolabelling requires that the applicant's suppliers are Chain of Custody certified by the FSC/PEFCs schemes. The requirement for Chain of Custody certification contributes to traceability in the supply chain within the FSC and PEFCs guidance and control systems for traceability. The company's Chain of Custody certification proves how certified wood is kept separate from not certified wood in the production, administration and warehousing and is checked annually by independent certification bodies. There exist different types of Chain of Custody certifications, which vary according to the minimum content of certified wood and the way this is calculated. Both schemes allow, within specified circumstances and rules, to mix wood from certified

[87] UN: Forest Products – Annual market review 2011-2012, ch. 10
[88] https://ic.fsc.org/en/our-impact/timber-legality/ensuring-compliance, visited 2015-12-21
[89] http://www.pefc.org/certification-services/eu-timber-regulation, visited 2015-12-21
[90] http://ec.europa.eu/environment/forests/timber_regulation.htm

forests with recycled material or legal wood from non-certified forests. Therefore, it is not certain that a specific batch of FSC or PEFC certified wood necessarily come from certified forest. In all cases, the remaining share of the wood shall comply with a number of minimum requirements to ensure that it can be considered as legal timber. Both the FSC and PEFC schemes allow several methods to verify the traceability: Physical separation method, percentage-based method and volume credit method. Nordic Ecolabelling accepts all FSC and PEFCs methods to verify traceability and the share of certified and controlled wood/sources. The applicant's suppliers must submit a valid FSC/ PEFC Chain of Custody certificate, covering all wood raw materials used in the Nordic Swan Ecolabelled buildings, as documentation.

Nordic Ecolabelling equates recycled material with virgin wood material from sustainable forestry. Recycled materials not covered by an FSC/PEFCs Chain of Custody certification can also be used in Nordic Swan Ecolabelled products. Suppliers of recycled material are exempted from the requirement regarding FSC/PEFCs Chain of Custody certification.

Recycled material
Definition of recycled material (pre-consumer and post-consumer) is based on ISO 14021.

Pre-consumer material is defined as material diverted from the waste stream during a manufacturing process. Excluded is reutilization of materials such as rework, regrind or scrap generated in a process and capable of being reclaimed within the same process that generated it.

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

Nordic Ecolabelling considers by-products from the primary wood-using industries (sawdust, wood chips, bark, etc.) or residues from forestry (bark, branches, roots, etc.) as recycled material. Industries, which buy virgin wood (round wood) and primarily converts it into chips, are not counted as recycled material. Industries that process virgin wood (round wood) are counted as primary wood-using industries.

It should be noted that the EU Timber Regulation, as opposed to Nordic Ecolabelling, do not define by-products from the primary wood-using industries as recycled material. Sawdust, wood chips, bark, etc. or residues from forestry (bark, branches, roots, etc.) is subjected to the EU Timber Regulation, i.e. subject to requirements of traceability and legality.

The applicant/manufacture shall demonstrate that the wood has the status of recycled material according to the above definitions

Certified wood raw materials
Applicants must document that at least 70% of all wood raw material (virgin/recycled material) used in the Nordic Swan Ecolabelled product/production line comes from forestry certified under the FSC or PEFC schemes or is recycled material. The remaining proportion of wood must meet the requirements of FSC controlled wood or PEFC controlled sources or be recycled. The requirement must be documented as purchased

amount of wood annually. The requirement limit to a minimum of 70% of all wood raw material (virgin or recycled), correspond to the FSC and PEFCs requirement limit for use of the respective labels on products, such as FSC Mix and PEFC certified. FSC and PEFC has together five recognized official existing labels. Further information about the use of labels can be found on FSC[91] and PEFCs[92] websites. The requirement can make it easier for manufacturers of Nordic Swan Ecolabelled products to document the requirement, as they can demand labelled FSC/PEFC products.

Recycled material is explicitly highlighted in the requirement as both FSC and PEFCs schemes include certified recycled materials. Nordic Ecolabelling equates as previously mentioned recycled material with virgin wood material from sustainable forestry. Recycled materials not covered by FSC/PEFCs Chain of Custody certification, can also be used in the Nordic Swan Ecolabelled products. The share (% units) of recycled material must meet the requirement regarding the share of wood raw material certified as FSC or PEFC sustainable forestry.

The applicant/manufacture must demonstrate that the quantity of certified wood raw material or recycled material is met by invoice or delivery note (paper or via e-invoicing), which also indicates the company's certification codes from which the wood raw material is purchased from. It must be clear which parts of the packing slip or invoice delivery that is certified (e.g. claim/material category must appear, such as FSC MIX 70 % and FSC 100%, associated with the product concerned on the invoice or delivery note). A valid FSC/PEFC labelling on the purchased wood product or an unbroken packaging can also be used to document the requirement. The FSC/PEFC label often hold a certification number or a license code, which provides information on the authorized dealer that sold the product as certified. The certification schemes have different rules for labelling and logo use, and if in doubt, it is advisable to consult the individual schemes **website for more precise information about the rules.**

Certification and accreditation
The certification must be conducted by an independent, competent and accredited third party and follow the relevant international guidelines for the certification: ("ISO/IEC 17065:2012 Conformity assessment – Requirements for bodies certifying products, processes and services" or equivalent and accredited by an accreditation body operating in accordance with "ISO 17011:2004 Conformity assessment – General requirements for accreditation bodies accrediting conformity assessment bodies" or equivalent).

The accreditation (i.e. verification and approval of the certification firm is working properly) must be undertaken by a national or international body, systems and procedures are consistent with ISO 17011:2004 Conformity assessment – General requirements for accreditation bodies accrediting conformity assessment bodies or equivalent.

Any product labelled with FSC or PEFC (logo licence product) will also be approved as documentation.

[91] http://welcome.fsc.org/understanding-the-fsc-labels.27.htm
[92] http://www.pefc.co.uk/chain-of-custody-logo-use/pefc-label



Figure 4: Image of logo license for certified products.

In the autumn of 2016, it was made possible for licence applicants to, in exceptional cases, purchase wood and wood products from suppliers that do not hold traceability certification. The requirement was supplemented with a whole new envelope text as separate verification is required.

The background is that in Finland there are no roof truss producers that are CoC-certified. However, the roof truss producer can purchase timber from a CoC-certified sawmill. Roof truss producers are typically small, local companies with a few employees. The same situation can arise for other small sub suppliers such as carpentry shops. For these small companies achieving CoC certification is not worthwhile.

The following example shows that it is possible, by alternative means, to ensure and verify that the timber purchased fulfils all of the timber requirements set by Nordic Ecolabelling:

Sawmills that are traceability certified, sell timber to importers that are also traceability certified. The timber is then sold to a turning shop that is not traceability certified. Finally, the turned bed legs are delivered to the bed manufacturer and licence applicant that is not traceability certified either.

Documentation to strengthen this chain:

- The importer completes the Nordic Ecolabelling documents with what and where they deliver and present a valid CoC certificate.
- The invoice documents the importer's delivery to the turning shop.
- A written agreement between the turning shop and the bed manufacturer/licence applicant that they will only deliver the certified timber specified on the invoice, and that they have a duty of notification to the bed manufacturer on any change of supplier.

In October 2017, the timber products curtain walls and underlay on roofs were added to the bullet list. This correspond to how this requirement has been interpreted in the applicant process according to criteria generation 2, even though curtain walls and underlay on roofs do not bear vertical loads as the other parts of the bullet. It also corresponds to the aim of the requirement to pose requirement on the major wooden parts in a building. A curtain wall constituent of wood is the most common type of exterior wall in a multi-family building with a load bearing frame in concrete.

On the other hand, the wood-based construction products used to a minor extend shall not be covered by the requirement on certified wood raw material.

O29 Durable/resistant wood for outdoor use

Timber impregnated with heavy metals and/or biocides are not allowed in Nordic Swan Ecolabelled buildings any supplementary buildings and other constructions, se the introduction of chapter 4.4. The requirement in not applied to timber in class B according to the Nordiska Träskyddsrådet (Nordic Wood Preservation Council) classification or corresponding classification.

Exemptions from the general requirement may be made for:

- wood in contact with fresh or saltwater
- wood in direct contact with the ground
- wood in load bearing constructions where specific demands of strength of the material are demanded
- wood above ground where there is a considerable risk of rotting, i.e. risk classes 4 and 5 according to EN 335.

Regardless of exemptions, durable wood for outdoor use must fulfill requirement O22 Substances excluded from construction products, construction goods and materials.

Nordic Swan Ecolabelled sustainable durable wood for outdoor use fulfills the requirement and may be used without completing a form. Only the manufacturer, product name and licence number must be stated.

The aim of the requirement is to limit the use of pressure-impregnated timber in class M, A and AB since heavy metals and biocides are used in the impregnating process.

Nordiska Träskyddsrådet (NTR) (Nordic Wood Preservation Council) has drawn up an industry standard to define the Nordic wood preservation classes within the framework of current European standards and is a Nordic implementation document for EN 351.

✉ To use exemptions from the general prohibition, the need for pressure-impregnated timber must be documented in writing, stating the reason. An approval decision by Nordic Ecolabelling must be obtained.

Background

The purpose of the requirement is the same as in version 2 of the criteria, i.e. to strongly limit the use of pressure-treated timber since the process entails that the timber is treated with heavy metals (copper salts) and biocides. The general prohibition does not apply to wood that is impregnated according to NTR class B (or equivalent), except for exterior woodwork such as windows and doors.

To be able to function in practice, a small number of exceptions from the general ban on pressure-treated timber are listed. After the consultation, wood in load-bearing structures that demand certain strength has been added to the accepted exceptions. The reason is that there are not always alternatives to pressure-treated timber that also fulfils the durability requirements for e.g. balconies.

The requirement's scope is broader, since in version 3 of the criteria, pressure-treated timber may not be used in playground equipment or fencing, timber decking or similar, for Nordic Swan Ecolabelled small houses, apartment buildings, schoolyards or preschool yards. Another difference is that according to version 2 of the criteria, only timber decking/outdoor areas and similar directly connected to the building were included. This delineation no longer applies.

In order to extend the timber's lifetime in outdoor environments, it is processed in different ways. The impregnating agents traditionally used contain active substances whereby the timber is protected by the toxicity of the additives (heavy metals or other biocides). A negative side-effect of the use of toxic substances is that the substances often have adverse health and environmental characteristics that may affect people and the environment if they leach out over time. There are alternative methods to achieve durable timber that does not entail the use of heavy metals or other biocides.

Originally, the best-known environmental problems with durable timber were related to the use of copper, chromium and arsenic (CCA) and creosote as impregnating agents. CCA impregnation has been prohibited in the Nordic region since 2012 and use of creosote is only permitted for commercial use. The chemical burden from conventional impregnated timber is thus considerably reduced. Nonetheless, considerable amounts of copper and other biocides are still used in conventional pressure-impregnated timber, which constitutes an environmental burden in the form of the use and leaching of substances that are hazardous to health and the environment.

Today, the impregnation method most commonly used is aqueous agents that normally contain copper salts together with organic fungicides as active substances. Due to the prohibition of CCA impregnation, the amount of copper used in impregnation agents increased, since these agents are not effective to prevent rot fungi. The copper content in the timber has increased from 0.5 kg to 1 - 2 kg per cubic metre, depending on the salt formulation.[93.] A trial in 2010 with timber impregnated with copper and boron estimates that between 8 and 15% copper and approximately 30% boron will leach out in the course of 20 years. The trial was performed by the International Research Group on Wood Protection[94].

Aqueous copper compounds (copper salts) are toxic for humans and can be highly toxic, even in small quantities, for aquatic organisms. The compounds may cause long-term adverse effects in the aquatic environment[95.] Copper also binds easily to organic matter/organic compounds and is less available and thereby less hazardous in its bound state. The Earth's copper reserves from ore are estimated at approximately 350 million tonnes, i.e. a limited resource compared to the consumption of approximately 10 million tonnes annually. It is therefore important to effectively reuse copper and[96] to use alternatives where this is possible.

Greater use of alternative timber impregnation methods has the potential to achieve considerable environmental benefits by reducing the use of toxic chemicals. There is also potential to reduce the use of the Earth's limited copper reserves.

Pressure-impregnated timber is assessed in the Nordic region in accordance with the Nordic Wood Preservation Council's four-class system: The M, A, AB and B classes indicate degree of protection and durability. The system entails adjustment to the EN 351 and EN 599 standards and indicates requirements of penetration and absorption of

[93] Treteknisk (Norwegian Institute of Wood Technology) website: http://www.trefokus.no/fullstory.aspx?m=329&amid=13078 (2014)
[94] Morsing et. al., 2010: "Comparison of laboratory and semi-field tests for the estimation of leaching rates from treated wood - part 1: above ground (UC 3)". IRG/WP 10-50274.
[95] Statens forurensningstilsyn, Vurdering av virkemidler for å redusere utslippene av kobber (Assessment of methods to reduce copper emissions). 2005.
[96] Store norske leksikon (Norwegian Encyclopeadia): http://snl.no/kobber

various impregnation agents for the respective classes. EN 599 contains a description of the various methods to test durability.

Table 6: Relation between European standards and the Nordic implementation, NTR

Area of use	NTR	EN 350-1	EN 335-1
Timber for use in permanent contact with saltwater (quay structures, docks, piling)	M	1 (very durable)	5
Timber for use in permanent contact with soil or fresh water (terraces, lampposts, fences, bridges)	A	2 (durable)	4
Timber that is exposed to wind and weather, but is not in permanent contact with soil or water (windows, doors, cladding)	AB	3 (moderately durable)	3
Timber for use above ground that is not directly exposed to the elements, but which may be exposed to brief moisture (trusses, roof underlays)	B (normally no need for im-pregnated wood)	4 (not very durable)	2
Timber for indoor use	B	5 (not durable)	1

The environmentally adapted alternatives to impregnated timber are not based on the penetration of active substances, but on a modification of the wood. Modification may either be heat treatment of the wood, or its chemical modification. The test methods of the Nordic Wood Preservation Council are not especially adapted to these methods. Alternative methods are being developed that may also be used for the alternatives. Until these are available, an adaptation of the EN standards and the Nordic Wood Preservation Council's system is used. The basis is established EN tests and the requirement level is equivalent to the Nordic Wood Preservation Council system for classes AB, A and M.

Timber for use class AB constitutes the largest volume in the market today, and it is within this segment that the environmental benefits from the transition from traditionally impregnated timber to environmentally adapted timber are greatest. One of the most important characteristics of the newly developed alternatives is that their biological durability is in line with traditionally impregnated timber. Chemically modified timber can be used in contact with soil and fresh water, as well as above ground. Heat processed timber is most often used above ground.

Using the same classes as in EN 350-1 for impregnated and modified timber, the following durability classes are obtained:

- Impregnated wood (in accordance with NTR): 1
- Heat processed timber: 1-5 (depending on wood species and process)
- Acetylated radiata pine: 1-2
- Furfurylated pine: 1-2

5.8 Quality management of the construction process

O30 Air permeability

The licensee must have a routine to measure air permeability in order to ensure that the project designed air permeability requirements are fulfilled. The routine must include defect analysis and corrective measures in cases where the project designed permeability is not achieved in the Nordic Swan Ecolabelled building. The routine may be an element of self-inspection.

For small houses, pre-schools and school buildings air permeability must be measured for each building. For standardised products, air permeability can be measured for a representative selection that amounts to at least 10% of the total number of small houses, pre-schools and school buildings constructed.

For apartment buildings and extensions to apartment buildings, air permeability must be measured for a representative selection that constitutes at least 10% of the total number of flats, but always at least one flat. Both flatwise and stairwise measurement of air permeability is approved.

Where air permeability is measured on a random sample basis, there must be a routine to ensure that other flats or buildings have equivalent air permeability.

✉ Routine(s) to measure air permeability comprising measurement method, error analysis when the measured value deviates from the project designed value, and corrective measures.

🔑 The result of the air permeability testing must be submitted to Nordic Ecolabelling on request.

Background

The air permeability requirement has been moved from the energy section to the quality section. The requirement no longer includes the permeability threshold, but only that routines exist to perform air permeability testing and to take corrective measures when required. The reason is that an impermeable building is a means to achieve good energy performance, and not a goal in itself. Or in other words, that the building's energy consumption is the product and permeability is one of several contributing factors. Making requirements of one of these factors does not seem completely logical since requirements could just as well be made of thermal bridges or U value, windows, insulation, etc.

Air permeability testing of apartment buildings has only very limited manageability for impermeable to the surroundings, which is what affects heat losses. Internal leakage, i.e. leakage between flats and from flats into stairways, is normally a considerable element of the leakage of air on testing permeability at flat level. To set requirements for the pressure testing of an entire building in order to give an accurate permeability value is not practical or financially reasonable.

Air permeability testing gives a picture of the building's permeability compared to the project designed/intended value, which is a type of quality control of the result. Good air permeability not only affects the size of the heat losses but is also important for several apartment buildings in order to minimise odours between flats or from flats out into stairways, which is a quality aspect.

O31 Management of requirements on products and materials

The licensee must ensure fulfilment of the material requirements in chapter 4 (requirement O15 up to and including O29). If the licence applicant uses subcontractors for all or parts of the building, it must be documented that the subcontractor is aware of and adheres to the materials requirement.

Construction products, materials and chemical products added to the building via subcontractors must also be controllable, e.g. via agreements and inspection.

New products and materials that are added after the license is granted must be approved by Nordic Ecolabelling if they are subject to the requirements in chapter 4.

✉ Routines or agreements that show how materials requirements O15 to O29 are fulfilled for the entire construction process.

✉ If subcontractors are hired; their routines or agreement for compliance with requirements on products and materials must be reported.

Background

On licensing this requirement has proved to be important and is unchanged. The requirement is intended to ensure fulfilment of the materials requirements at various stages of the process, and between the different parties involved. Many questions may arise during the process. How should communication take place? Who requests attestation of products and chemicals, and how early? Who must be informed when products do not fulfil the requirements and approve any cost increases or delays? How should reconciliations be made?

O32 Information to those involved in the construction process

Employees, including supervisors, site managers, sub suppliers and subcontractors involved in the construction process must have the relevant knowledge to be able to ensure fulfilment of the requirements in conjunction with the project design and construction of a Nordic Swan Ecolabelled building.

Parties that require information on how chemical products must be handled to avoid risks to people and the environment in another language than that of the country in question must receive this information.

✉ Routine in the quality management system and training programme.

🔑 Lists of participants after completion of training.

Background

The requirement of information to those involved in the construction process (O43 in version 2) has been supplemented with the need for the licence applicant to verify the requirement with the training programme in order to show the content and scope of the training/information. The licensee is also required to register who has taken the training/attended the information event. The aim is to provide information on the Nordic Ecolabelling requirements and how the requirements can affect and change processes and routines for a non-Nordic Swan Ecolabelled project.

It has also been supplemented to include that a person who handles chemical products at the construction site and who needs information on how the chemical products must be handled to avoid risks to people and the environment in another language than that of the country in question, must receive this information. The reason is that skilled workers from countries outside the Nordic region are hired as subcontractors at construction sites. From working environment, safety and environmental viewpoints it is important that information on handling chemical products is available in a language that everyone understands.

O33 The contractor's self-monitoring

The contractor must have documented self-monitoring during construction, in order to safeguard building quality. As a minimum, self-monitoring must include routines for:

- waste handling at construction sites
- moisture/damp prevention
- secure execution of water installations
- air permeability and testing
- electrical installations
- ventilation
- heating system
- routines for the performance of pre-inspection of the building before independent third-party control/final inspection.

If the licensee is not the same as the contractor, the contractor's self-monitoring can be used for verification.

✉ Description of the self-monitoring routines/system and the party responsible.

✉ Results of the self-monitoring performed for the first Nordic Swan Ecolabelled project must be submitted to Nordic Ecolabelling and thereafter on request.

🔑 More results of the self-monitoring can be controlled on-site.

Background

The requirement exists to safeguard the building quality. It is not possible to draw up a general checklist that fits all types of buildings and building processes. Nordic Ecolabelling may not be the inspecting party either. It is therefore a requirement that there must be one (or several) persons responsible for control of the building process, hereafter called the control officer. For Sweden, the requirement is matched by the Swedish Planning and Building Act's self-monitoring requirement.

The control officer must draw up control plan(s) and also ensure compliance. As a minimum, the control plan must include a number of aspects that are listed in the requirement. Today the requirement is a combination of requirement O39 Control during building and O40 Inspection of the completed building, from version 2 of the criteria.

The requirement focuses on routines for/a system for self-monitoring. Nordic Ecolabelling will do random check-ups on the result. This will preferably be conducted during the on-site inspection, but the result can also be asked for at another occasion. A sound report/assessment can be a suitable additional verification on the self -monitoring of sound in the building.

O34 Inspection of the completed building

The completed building must be inspected for its quality. The inspection must be performed by an independent third party with relevant expertise.

If the final inspection reveals defects, these must be subject to an action plan and the defects must be rectified as agreed between the parties.

For the licensee's first Nordic Swan Ecolabelled building and for the following 25% of the small houses and for all (100%) apartment buildings, pre-school buildings and school buildings, final inspection must be performed. Unless stipulated by legislation or

practice in the industry, flats and areas of a building may be inspected on a random basis.

Unless stipulated otherwise by the national building regulations, as a minimum the final inspection must include the general status of the building and documentation of any quality breaches and building defects.

✉ Final inspection report.

✉ Documentation to reinforce the independence and competence of the person performing the inspection.

Background

Inspection of the final building aims to discover and document quality breaches, non-conformances and building defects. The requirements may be found in the individual country's building regulations and they may also be more far-reaching. The inspection protocol may also have an important legal status that is not of any significance to Nordic Ecolabelling.

Compared to version 2 of the criteria this is relatively unchanged, although one change is that the agreement with the independent inspector is not required to be presented. On the other hand, the relevant expertise must be proved, for example with an excerpt from a CV or competence description on a website or similar.

Waste handling in the construction process - removed requirement

Version 2 of the criteria included a requirement (O36) comprising a waste plan, routines and agreements for well-functioning waste handling. This requirement is generally in accordance with Nordic countries' legislation. This requirement does not give any added value and has therefore been removed.

However, there is a point requirement for waste handling that focuses on increasing recovery ratios as a measure of good and effective waste handling in accordance with the EU's objectives. See also the P13 point requirement.

5.9 Quality and regulatory requirements

O35 Documentation

The licensee must archive the documentation that is sent in with the application.

🔑 On-site inspection.

O36 Documentation of the buildings

The licensee must have a list of the constructed Nordic Swan Ecolabelled buildings. The documentation must be stored by the licensee for at least five years after occupation.

🔑 On-site inspection.

O37 Planned changes

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

✉ Routines describing how planned product and market changes will be handled.

O38 Unforeseen non-conformities

Unforeseen non-conformities that affect Nordic Ecolabelling's requirements must be reported to Nordic Ecolabelling in writing, without delay and logged.

✉ Routines describing how unforeseen non-conformities in writing and without delay will be handled.

O39 Complaints

There must be routines for the documentation, reporting and handling of any complaints/claims concerning the Nordic Swan Ecolabelled buildings. It must be clearly stated that the licence applicant is responsible for the customer and is the party that the customer must contact concerning any complaints and claims.

✉ Routines describing how complaints and claims will be handled.

O40 Laws and regulations

The licensee must ensure compliance with all relevant applicable laws and provisions at all production sites for the Nordic Swan Ecolabelled buildings, e.g. with regard to safety, working environment, environmental legislation and site-specific terms/concessions.

✉ Duly signed application form.

Background

Version 2 of the criteria presents a number of quality management requirements (O43 up to and including O50). Several of these are general quality requirements that in principle are always included in Nordic Ecolabelling criteria. In most cases only minor clarification of the requirement text has been undertaken. The requirement of "Information to those involved in the construction process" has been moved to the Quality management of the construction process section. The requirement concerning "Organisation and responsibility" has been removed and the required information concerning the contact responsible for the relevant project is instead requested in the electronic forms called "Licence application" and "Application for extension" completed for each project. The requirement concerning marketing rules has also been removed and is instead also managed via the application form.

5.10 Instructions for residents and property managers

O41 Operation and maintenance instructions

There must be overall general information and operation and maintenance instructions for the Nordic Swan Ecolabelled building. The aim is to ensure that the property managers of the building and the residents are aware of the building's and technical installations' operation and need for service and maintenance, and the most appropriate measures from an environmental viewpoint.

Where relevant, the information must include normal operation, performance of maintenance or service, whether special expertise or authority is required, and whether special products are required to achieve the objective. If special products are recommended, they must fulfil the requirements on chemical products, construction products, construction goods and materials in chapter 4 of the criteria or be ecolabelled with the Nordic Swan Ecolabel or the EU Ecolabel.

The information must include the following (where relevant).

- Manual for the heating system and ventilation system stating how the systems are adjusted to achieve the best possible energy efficiency and indoor climate. The manual must include time intervals for service and filter replacement.
- Maintenance and control of electrical installations, including energy meters.
- Description of how the building is protected from radon radiation.
- Surface treatment of the façade and other weather-exposed wooden parts such as terraces, veranda, wooden railings, etc.
- Care and maintenance of windows, including solar protection.
- Maintenance of roof surfacing, including cleaning of gutters and drainpipes.
- Cleaning and maintenance/surface treatment of floors.
- A description of such equipment as white goods, WCs, etc.
- A recommendation to use energy-efficient light sources.

☒ Overall general information and operation and maintenance instructions as above.

Background

The requirement of operation and maintenance instructions has functioned well in case processing, is assessed to be of environmental benefit, and increases the chances of the building maintaining the good environmental status it held when it was constructed. The requirement has been specified but is in principle the same. Unclear aspects such as the term "maintenance plan" have been removed.

Good instructions for use are a prerequisite for ensuring that technical installations, equipment, vital building elements and materials in the indoor environment are cared for and maintained over time in a way that ensures that they function well, with good energy efficiency and a long lifetime. Therefore, before the building is taken into use, there must be written instructions for the performance of care and maintenance. In case processing, the table of contents of the flat binder for residents, as well as the property owner's operations and maintenance binders, will together fulfil the requirements.

5.11 Point-score requirements

In this chapter include all point-score requirements. In requirement O3 in chapter 5.3 General Requirements state the share of possible points that must be gathered to be granted a license.

To gather point-score, measures on supplementary buildings as garages, refuse depots, bicycle storage rooms, sheds and similar items can also be counted for.

P1 Energy contributions from local energy sources or energy recovery

Solar collectors, solar cell panels or heat recovery from domestic hot water consumption that are installed and that give an annual energy supplement to the Nordic Swan Ecolabelled building give points as described below.

If the building is supplied with energy from several local, renewable energy sources, points will be added, and maximum 6 points can be achieved.

Solar collectors that are calculated to provide the following share of the buildings' calculated total use of domestic hot water:

- 10 – 25% give 1 point
- 26 – 50% give 2 points

- > 50% give 3 points

Solar cells that are calculated to provide the following share of the buildings' calculated energy use (household electricity is not included):

- 10 – 15% give 1 point
- 16 – 25% give 2 points
- > 25% give 3 points

Heat recovery from wastewater that is calculated to provide the following share of the buildings' calculated total use of domestic hot water:

- 5 – 15% give 1 point
- 16 – 25% give 2 points
- > 25% give 3 points

Local energy sources are defined as an energy source at the building or in its immediate vicinity.

✉ Description of the type of local renewable energy source or energy recovery, its location, calculation of annual energy generation and percentage of the calculated energy need relative to calculated or real energy use.

Background

The requirement was also included in version 2 of the criteria, but in that case was independent of the ratio of energy generated, and only gave the possibility of 1 point. The revised requirement can now give 1 or 3 points, depending on the proportion of the energy requirement calculated to be provided by the local renewable energy source. If the building is supplied with energy from a combination of local renewable energy sources, points are added.

Solar collectors, where solar radiation is converted to heat energy, are related to the ratio of the domestic hot water requirement. The reason is that a solar collector gives most heat in the summer months, when there are considerably more hours of sunshine than in winter. Yet the space heating requirement is low in the summer months. For solar cell panels that generate electricity, the energy ratio is calculated as a share of the total electricity requirement. For heat recovery from wastewater[97] the proportion of the domestic hot water requirement provided by the heat recovery system is the measure used. Several types of heat recovery can be included in the requirement, such as pre-heating of water in processors, counterflow heat recovery from the wastewater network, and heat recovery from grey water. Heat recovery must be connected to at least one flat if the building consists of several residential units. Solar collectors and solar cell panels apply to the entire building.

The aim of the requirement is to further stimulate energy sources and energy recovery that might not normally be installed. The requirement has the same aim as the EU Directive on the energy performance of buildings (2010/31/EU). However, the Directive's definition of "energy from renewable energy sources" is broader than the renewable energy sources that yield points. The definition from the Swedish BBR "at the building or in its immediate vicinity" is a clear definition that links the energy supplement to the actual building. It also makes the energy source independent of the site, which is significant for the Nordic Swan Ecolabelling of buildings. Solar cell panels and solar

[97] Wastewater is a joint term for surface water and wastewater. Surface water is rainwater and water from melting snow, etc. Wastewater is often divided into black water (from toilets) and grey water, which is dirty water from baths, showers, washing up and laundry.

collectors located at a neighbouring building are also approved for as long as the electricity generated supplies the Nordic Swan Ecolabelled building.

Locally generated wind power is problematic due to noise and solar fibrillation. Normally, wind turbines are not erected at or near homes or pre-school/school buildings. Nordic Ecolabelling does not wish to reward local wind production due to the aforementioned risks of problems, so that wind falls outside the point requirement, even though wind is a renewable energy source.

The building regulations of the various Nordic countries give various different weighting to local and renewable energy sources, but Nordic Ecolabelling does not see this as an impediment to the point requirement. The fact that renewable energy in national building regulations reduces the energy purchasing requirement is not an impediment either to Nordic Ecolabelling awarding points for local renewable energy sources.

The local renewable energy source can be placed on a supplementary building, but the share for which points are rewarded intended the Nordic Swan Ecolabelled building (the small house, apartment building or building for school and pre-school)

P2 Individual metering of domestic hot water

In buildings with shared hot water supply to several residential units, 1 point is given if the system:

- is either equipped with a presentation display so that residents can view their consumption at least every 24 hours.

or

- for comparison, displays the domestic hot water consumption of other residential units in apartment buildings, either separately or as mean values at least on a monthly basis.

Measuring instruments must be approved in accordance with the measuring instruments directive (MID) 2014/32/EG or an equivalent method/standard, see Appendix 1.

✉ Description of the system(s) for individual measurement of domestic hot water that are installed.

Background

The requirement of individual metering of domestic hot water was included in version 2 of the criteria but was part of a broader requirement that also included the requirement of individual heat metering. This requirement has been removed - see the previous energy section. The requirement of individual metering of domestic hot water has also been changed from an obligatory requirement to a point-score requirement.

The Swedish National Board of Housing, Building and Planning's report from 2014[98] uses simulations to show that individual measurement of domestic hot water is never cost efficient, i.e. profitable, at a saving of 10%. On a 20% reduction of domestic hot water consumption, measures may be profitable, but only on the condition of low installation costs and a higher sewerage tax than the municipal average. This motivates changing the individual domestic hot water metering requirement to a point-score requirement. In this respect there are variations between the Nordic countries. Denmark and Finland have low requirements of new production. The Swedish industry practice

[98] [98] Individual metering and billing for new buildings and conversions. Report, 2014:29. Swedish National Board of Housing, Building and Planning.

Sveby's user input data[99] used in energy calculations has previously shown that it is possible to achieve a 20% reduction of the annual standard for domestic hot water in apartment buildings, i.e. the standard value for domestic hot water can be set at 20 kWh/m^2 (Atemp), instead of the normal 25 kWh/m^2. In the new, revised Sveby guidelines developed by the industry, applying as from 2012, this deduction has been removed. Sveby refers to the new measurements which show that this saving has not been realised.

Opportunities to save domestic hot water are linked to energy prices. Due to low district heating costs in Sweden, an IMD for domestic hot water can even be counterproductive. When a family see how little they can save from using less hot water, this can lead to their no longer thinking about their hot water consumption, so that their consumption increases instead. In Denmark, where a kilowatt hour of heating costs more, it can be seen how IMD instead leads to water savings.

Just as before, Nordic Ecolabelling's point requirement rewards if the resident can view his or her current consumption or see the consumption of the other flats in the property. We believe that the incentive for comparison with neighbours is sufficiently strong to justify points being scored.

Metering system and measurement instrument requirements
As in the version 2 criteria, measurement instruments must be MID-approved or fulfil the requirements of another method or standard with the same measurement accuracy. The approval concerns the measurement element and not the communication element.

There are different measurement methods, of which flow measurement is the most common. It is also possible to measure heat energy in domestic hot water, even though this is not customary. There are several flow measurement principles. The most common are vane anemometer and ultrasonic meters, with the last-mentioned increasing strongly. The advantage is that there are no moving parts that might be affected by pollution and water's calcium content. A vane anemometer may start to run slowly after some years. The meter may display too little or too much, and also not start up on a low flow[100].

There are various reading systems. For the fixed installation of collection units, reading is usually between once an hour and once every 24 hours. There are also systems for the installation of collection units on vehicles, called "drive by". The information is used for monthly billing and also so that tenants themselves can log in to view their consumption pattern, in which case better time resolution is required.

P3 Calculation of hot water circulation (HWC) losses and buildings' climate imprint

HWC losses

If the hot water circulation (HWC) energy losses are calculated for a project or a standardised building, 1 point is gained.

Standard values or table data are not accepted as calculated values.

The point-score requirement applies solely to apartment buildings or other type of buildings where the national building regulations pose requirements on maximum waiting time for hot water in the tap.

Electricity cable warming the domestic hot water system in the building is not covered by the requirement and cannot be granted points.

[99] User input data for energy calculations in homes. Sveby programme, project report 2009-04-14.
[100] Personal communication with Gunnar Tysk, EcoGuard AB.

Buildings' climate imprint in Finland

If the building's climate imprint is calculated, 1 p is given.

The calculation shall cover the entire life cycle of the building and shall be carried out in accordance with the Finnish Ministry of the Environment's established method for the whole life carbon assessment of buildings

☒ Energy calculation clearly stating calculated HWC losses.

☒ Climate calculation, where the building's climate imprint is clearly stated

Background

To reduce the time waiting for hot water at the tapping point, often domestic hot water circulation (HWC) is installed. This primarily concerns apartment buildings and premises and is governed by the building regulations for the maximum waiting time before there is hot water in the tap, so that there may be national differences. By allowing domestic hot water to continuously circulate, hot water will always be available close to the tapping point.

But constant domestic hot water circulation leads to energy losses that may be significant in a building. In a study of four low-energy buildings in Sweden losses as high as 12 kWh/m^2 were measured, including thermal management losses[101]. The HWC losses depend on the temperature difference, the thickness of the pipe insulation and the size of the heat emitting surface, i.e. mainly the length of the pipes. The losses from 18 or 22 pipes, with 20 mm of insulation, are 5 or 6 W/m, while with 40 mm of insulation the losses may be reduced to 4 W/m. The heat emitting surface (the length of the pipe) is mainly affected by well-considered location of kitchen and bathroom. The temperature difference is, on the other hand, relatively constant[102].

In connection with project design it is important at an early stage to determine the location of kitchen and bathroom, in order to optimise the shaft positioning and laying of pipes. If it is necessary to lay separate hot water circulation loops in flats in order to minimise the waiting time for hot water, this will have a negative impact on the building's energy performance. HWC is an item that unfortunately is not always prioritised in the construction process and is not transparent to the property owner either. One explanation is that this is not so simple to calculate. Another explanation is that some calculation programs do not have clear input data fields for HWC losses. Some of the losses will be to the benefit of the building, however, e.g. because the lost energy heats a stairway or storeroom.

Inspired by how this is handled in Finnish building regulations, Nordic Ecolabelling proposes to use one (1) point to reward how HWC losses are calculated, and that the calculated value is applied to energy calculation, instead of either being forgotten completely, or using standard/table values. Calculating losses instead of not including them at all, or by using standard values, creates an awareness of energy losses. If losses are observed, there is a greater chance of their being addressed, e.g. via increased insulation or by reducing the number of metres of piping via optimum shaft location. Te

[101] Lågenergihus En jämförande mätstudie av fyra flerbostadshus. (Low-energy house. A comparative measurement study of four apartment buildings.) 2013 Report. P. Wickman; E. Sandberg. Sveriges Centrum för lågenergihus (Swedish centre for low-energy buildings).
[102] PowerPoint presentation Installationsssytem i energieffektiva byggnader (Installation systems in energy-efficient buildings). Tekn. Dr Per Kempe. Project engagement.

calculations performed in accordance with Finnish building regulations are sufficient verification of the requriment.

Nordic Ecolabelling does not wish to give credit for installing electrical cables to heat water in tapwater pipes. Therefore the calculated energy consumption from the electrical cable requirement does not give any points.

The Finnish Ministry of the Environment has begun to test the methodology developed for calculating the climate imprint of buildings. The first phase is a test period that extends from autumn 2019 to summer 2020, during this period it vill be evaluated how the method is suitable for pre-planning and construction projects. The method, Calculation of buildings' carbon footprint, will then be adjusted and a mandatory CO2 limit will be introduced in Finnish building regulations during 2023. The calculation method covers the entire life cycle of the building, from the production of construction products to transport, construction and work on construction sites, use and repairs and demolition and recycling at the end of the life cycle. The purpose of the calculation method is to make it easier to reduce the climate impact of buildings through wise choices. Nordic Ecolabelling has decided to introduce an optional score for licensees in Finland with the aim of encouraging them to try this method during the current test period.

P4 White goods of better energy class

If all products within a product type/category are of higher energy class than the mandatory level, 1 point is gained. A total of maximum 3 point can be given.

Table. Energy class mandatory level

White goods consumer	Lowest permitted energy class according to the Energy Labeling Directive (2010/30 / EU)	Lowest permitted energy class according to the Energy Labeling Regulation (2017/1369/EU)
Washing machine		D
Fridge		E
Freezer		F
Combined Fridge and freezer		F
Tumble dryer	A++	
Dishwasher		E
Oven	A	
Combined washing machine and tumble dryer (combi-product)		E

✉ Reporting of all white goods within a product type/category stating model and energy label/energy class in product specifications, or similar.

Background

Energy classification and energy labelling of white goods are subject to continuous development. Products are becoming more and more energy efficient and can thereby achieve better classification. New energy classes can also be added to the energy labelling directive, as was e.g. the case for refrigerators, freezers, washing machines and dishwashers, as well as tumble dryers, in 2010. This continuous development is positive

but is challenging to handle in ecolabelling criteria that set a certain requirement level that normally applies throughout the criteria's term of validity.

Nordic Ecolabelling will contribute to ensuring that white goods in the best energy classes are chosen for Nordic Swan Ecolabelled buildings. This point-score requirement is therefore introduced, as a supplement to the obligatory white goods requirement (O6). For several reasons, tightening the obligatory requirement in the course of the criteria's term of validity, i.e. white goods requirements in two stages, is not feasible.

The EU has updated its energy requirements for products and introduced a new energy labeling, Energy Labeling Regulation (EU) 2017/1369, which will replace the Energy Labeling Directive 2010/30 / EC. The scale in from A +++ to G is thus replaced by a scale in from A to G. In a transitional phase between the two energy labeling schemes, the two scales will exist simultaneously for the implementation to go smoothly and step by step. The requirement therefore reflects two types of energy labeling. From 19 March, the new Energy Label Regulation (EU) 2010/30 will apply, with the exception of stoves and dryers. Unfortunately, Nordic Ecolabelling does not have enough information about the energy labeling of wine to be able to set a requirement. It is therefore not possible to get points for wine coolers in P4.

P5 Energy efficient sanitary tapware

If all products within each product type/product category have at least the energy class given in accordance with Table 7, points are gained. A total of maximum 3 point can be given.

Table Energy labelled sanitary tapware.

Type/category of sanitary tapware	Energy class	Points
Washbasin and mixer taps	A	2
	B	1
Kitchen taps	A	2
	B	1
Touchless taps	n.a	1
Thermostatic mixers with shower*	A	2
	B	1

As sanitary tap ware is included; mixer taps, shower heads and showers mainly used to tap water for personal hygiene, cleaning and cooking and as drinking water

Flow regulator is permitted. Flow regulators are a (technical) device to limit the water flow to a specific volume and that only allow a greater water flow if this is activated by the user for a certain period in one and the same instance of use.

Bath mixer taps, taps in broom closets, two-handle shower mixers and sanitary fixtures for separate purposes that are not intended for household use are not subject to the requirement.

Energy label shall be granted according to SS 820000 Sanitary fixtures -Method to determine the energy efficiency of mechanical washbasin and mixer taps and SS 820001 Sanitary fixtures -Method to determine the energy efficiency of thermostatic mixers with shower.

**Points are only awarded when a hand shower is installed unless a verification is presented by certification bodies that show that both the roof shower and hand shower function meet the relevant energy class.*

✉ Reporting of the type/model/name of sanitary tap ware and the energy class label stating the measured energy consumption, certificate number and name of the standard.

Background

There is potential to reduce both energy and water consumption by selecting energy efficient mixer taps for kitchens, washbasins and showers. According to a report by SP Technical Research Institute of Sweden[103], there is a 40% energy savings potential from replacing an old tap with a new tap or shower in energy class A. The potential saving is greatest for apartment buildings since water and hot water consumption is normally higher per person for flats than for houses. One fifth of the small house's energy is used for hot water and for flats the share is even higher. For new production it is not relevant to make comparison with old taps, but there is potential to reduce energy consumption for hot water by installing energy-efficient domestic hot water fittings. Normal single-lever mixers in kitchens and laundry rooms give lukewarm water when the lever is pointing straight up. The new mixers give cold water in the same position. To get lukewarm or hot water, you must move the lever sideways. When you release the lever, it will spring back. This is a function to reduce hot water consumption.

The EU has performed a preliminary study to investigate the opportunity to introduce ecodesign and/or energy labelling of sanitary fixtures. Since 2013 Sweden has had voluntary energy classification and labelling of sanitary fixtures drawn up by the industry, the Swedish Energy Agency, the Swedish National Board of Housing, Building and Planning and SIS. The system is open to everyone that fulfils the requirements in certification rules and standards. Products that are energy labelled must have undergone laboratory testing. Energy classification and labelling include kitchen mixers, laundry room mixers and thermostatic mixers with showers. Energy labelling has also won ground in other Nordic countries. According to the major manufacturers' websites (Villeroy & Boch or Gustavsberg AB) there is exactly the same energy classification information on all Nordic countries' websites.

Version 2 of the criteria made requirements of water-saving taps via a maximum permitted flow. In the revision, Nordic Ecolabelling has wished to draw up requirements that do not reward products that solely throttle the water flow. The requirement has therefore been harmonised with the permitted energy consumption according to the voluntary Swedish energy classification system for sanitary fixtures. This means that in a Nordic Swan Ecolabelled building sanitary fixtures will be selected that focus on energy efficiency while retaining functionality, but which also indirectly reduce water consumption[104].

The latest information from October 2014 shows that a total of six major manufacturers have test their taps and showers and had them energy-labelled, see Table 7 below. The manufacturers are leading manufacturers in the European market. On the following website is a summary of all energy labelled sanitary tap ware:
http://tjanster.kiwa.se/produktcertifiering/energimarkning

[103] Saving potential of energy labelled taps and showers. SP Report 2014:3P08445, Sara Jensen, 2013.
[104] Marc van Brink, certification officer, Kiwa Sweden, personal communication.

Table 7: Comparison of energy-labelled sanitary fixtures. Source: Certification statistics, Kiwa Sverige AB

Type of fixture	Total number of energy-labelled products (st)	Number and proportion in energy class A	Number and proportion in energy class B	Number and proportion in energy class C
Kitchen mixer taps and washbasin mixer taps	177	23 items 13%	118 items 67%	37 20%
Thermostatic mixer taps with showerheads	27	22 81%	5 19%	0

Touchless taps are not uncommon in pre-schools and schools as they are vandal-proof and reduce the risk of spreading infection. The touchless taps in the market are relatively uniform in terms of flow, flush time and functionality. The voluntary energy classification for sanitary fixtures does not include touchless fixtures, so that these cannot achieve an energy class. Touchless fixtures are by definition energy- and water-efficient, since they only give the water and hot water that is actually needed and substantially reduce wastage, e.g. for brushing teeth and shaving. Therefore, all types of touchless sanitary fixtures are accepted.

The Nordic Ecolabelling requirement permits flow regulators/boosting. This makes an extra high-water flow possible when required, e.g. on tapping water in a large saucepan or the like, when large volumes of water are needed. This is often achieved by lifting the mixer lever to the top level. When it is released again, it automatically returns to low flow. Since low flow is not relevant when a bathtub or bucket is filled with water, bathtub mixers and mixers in cleaning rooms are exempt from the requirement.

The requirement uses other terms than in version 2 to make it clear that the requirement concerns kitchen mixer taps and washbasin mixer taps, but also other mixer taps in washbasins in laundry rooms, washrooms, guest toilets, etc.

June 25, 2019 a clarification was introduced that points for thermostatic mixers with showers are normally given only when hand shower is installed. The reason is that shower sets, which includes both hand- and overhead showers, on the market only hand shower function has an energy class. If and when the overhead shower function also has energy class B or A, then the combined product can get a point. However, in order to get points for a combination like this, a verification, from the certification organization, which shows that the product fulfils the requirement has to be shown.

Energy requirements of materials – introduction to new point requirements

On the evaluation of version 2 of the criteria, it was found that between 5 and 15% of the energy load in a building's life cycle takes place in the materials phase[105]. These figures vary according to the lifetime set for the building, the type of structure and whether low energy buildings are examined. The shorter the building's lifetime, the greater the significance of the materials to the life cycle's energy load. These figures are from a study that applies a lifetime of 100 years. There are also LCA studies that apply a lifetime of 50 years. The materials element's ratio would hereby in principle be doubled, and thus lie at 20 to 30%.

[105] Life Cycle Assessment of Different Building Systems: The Wälludden Case Study, SP Technical Research Institute of Sweden i 2013.

In a new Swedish study, researchers from IVL and KTH, together with representatives of the construction industry, have shown that for a newly built energy-efficient apartment building in concrete, the climate impact of the construction process is around just as great as from 50 years' operation[106].

It is also significant how the waste phase is calculated. The figures here show that the use phase still accounts for the largest share of energy consumption, but since national statutory requirements of the building's energy use in the use phase are being tightened continuously, the materials' share will be greater in the future. There are variations in which energy items can be influenced by ecolabelling requirements, and it is therefore also relevant to include materials, if controllable requirements can be made of these. The revision has therefore investigated how the Nordic Ecolabelling criteria can be used to set requirements to reduce the energy and climate impacts of the materials element.

A general challenge on setting energy requirements or other environmental requirements of the constituent materials in construction is that manageability is often low when it is necessary to go back several stages in the product chain in order to collect data. It can thus be difficult to set requirements that require major calculations or complex data collection several stages back in the product chain. The art of the game has thus been to develop a materials requirement that is based on information that it is realistic for the applicant to obtain, and that this is valid information,

Overall for the building, the cement-based material elements contribute to the greatest climate and energy impact from the materials. This is not surprising, since the cement-based materials are often used in large quantities in a building and produced via energy-intensive processes[107, 108]. For the individual building, the environmental impact from cement will vary, however, according to the building and construction type.

In a study of a reference house (ordinary Danish model house with e.g. back wall and partition walls of lightweight concrete, outer brick walls, and roofing of concrete roofing tiles) by the Danish Building Research Institute in Denmark, it was shown that the cement-based materials (concrete, lightweight concrete and mortar) and insulation materials account for 70% of the materials' total CO_2 emissions over 120 years[109]. Figure 5 from this study shows that the cement-based materials have the greatest impact.

However, this distribution would appear very differently for a house with the main emphasis on renewable resources such as wood. There is great variation in model houses in the Nordic region, in terms of choice of materials. In general, it would be possible to reduce the energy and CO_2 impact from the materials by choosing renewable resources, such as timber products. In this case it must instead be ensured that these timber resources are sustainable and make chemical requirements of any surface treatment. The research study from IVL and KTH (see footnote 51) also shows that if the same building were to have infill walls of wood instead of concrete on the long sides, the emissions (including transport) from the materials production phase would be reduced by 15%.

[106] The building's climate-impacted life cycle calculation of the climate impact and energy use for a newly constructed energy-efficient apartment building of concrete, Liljenström et al. 2015 (final report in SBUF project no. 12912). The report can be downloaded at www.sverigesbyggindustrier.se/publikationer
[107] Life cycle assessment of MiniCO_2 houses in Nyborg, Danish Building Research Institute, 2013.
[108] A. Dodoo, Life Cycle Primary Energy Use and Carbon Emission of Residential Buildings, 2011.
[109] Life cycle assessment of MiniCO2 houses in Nyborg, Danish Building Research Institute, 2013.

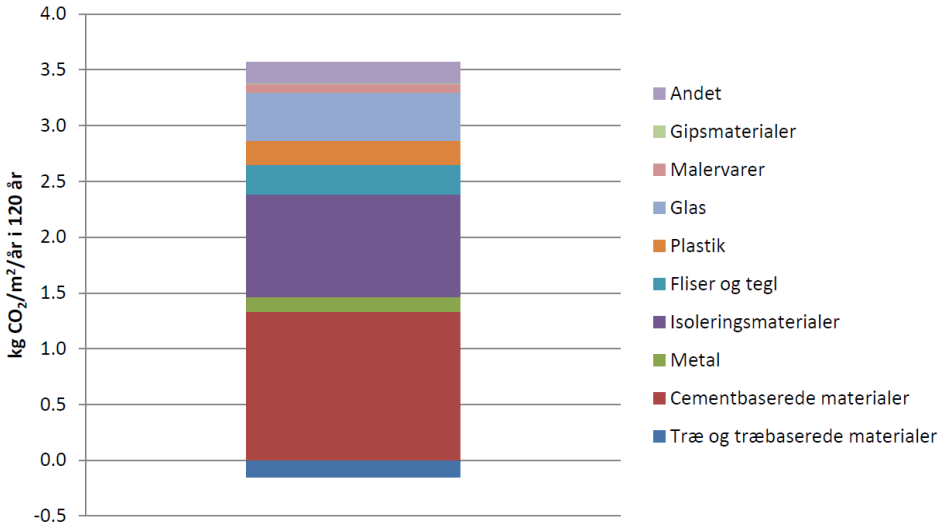


Figure 5: Materials' CO2 contributions in the building's lifetime including maintenance. Source: Life-cycle assessment of MiniCO2 houses in Nyborg, Danish Building Research Institute, 2013

Nordic Ecolabelling's aim is for it to be possible to Nordic Swan Ecolabel a building with timber structures, concrete structures, or possibly steel structures. Since there are great national variations in which building and construction types are common in the Nordic countries, Nordic Ecolabelling will not exclude specific construction types, but instead ensure that relevant environmental requirements are made of the individual construction types, and consider how concrete structures in particular are prevalent in the industry. It is therefore also a deliberate choice that the cement requirement is a point score and not an obligatory requirement. Buildings with concrete structures can achieve points by using concrete with a reduced environmental impact in requirement P6, and buildings with timber structures can achieve points in requirement P7.

P6 Cement and concrete with a reduced energy and climate impact

The requirement recognizes cement and concrete use with a reduced climate impact in two ways. Points can be taken from either A or B.

A) For each product type, points are given if at least half of the requirement within this product type is covered by cement products that contain cement clinker at maximum 70% by weight. A maximum of 2 points can be achieved.

Types of cement or concrete products that give 1 point each:

- Foundations
- Bearing systems and ground/floor decks
- Roof elements
- Wall elements
- Façade elements
- Balcony elements, terraces and verandas

Other types of cement products of equivalent size/scope may be approved by Nordic Ecolabelling.

B) For each measure taken in the building, stated below, one point is given.

- Deliberate work to differentiate concrete quality as required for the building (i.e. different concrete qualities for different construction details).

- Deliberate work with slim/lean concrete structures by taking various measures (high-performance concrete, reinforcement material, reinforcement technique, edge foundations, etc.)

A maximum of 2 points can be achieved.

Cement clinker is defined as the ratio of Portland cement clinker in the cement, in accordance with the definition in EN 197-1. Cement clinker is thus also included in the cement mix in the finished concrete. For concrete, the cement clinker ratio in the cement mix used in the concrete is calculated.

☒ Overview of cement/concrete products with maximum 70% cement clinker by weight, and calculation showing that the listed cement/concrete products constitute at least half of the product requirement within the product type.

☒ A) Product sheet stating the cement clinker content for each cement/concrete product that will give points.

☒ B) Documented measures taken deliberately for the building.

Background

Nordic Ecolabelling has investigated the opportunity to set requirements to reduce the materials' energy impact from construction and has concluded that the most realistic requirement in this version of the criteria is a point requirement that rewards the use of cement products with a low content of cement clinker. This also concerns cement products in concrete. However, the requirement is made of the ratio of cement clinker in the cement mix, as it is defined in the EN 197-1 standard, as this gives the best manageability. For concrete, it is thus the cement clinker ratio in the cement mix used in the concrete that must be documented.

In conjunction with the consultation and the dialogue meetings held during the revision, it became clear that the Nordic market for cement products appears to offer different products. Even within the same country there can be great variation in which products are available in the market. This is e.g. the case in Norway[110]. Together with the few suppliers in the individual regions, this has made it difficult to define a suitable level of cement clinker content in cement. As the requirement is an item requirement and thereby optional, it has been decided that a requirement will be made and that the proposed 70% cement clinker in the cement mix is the best requirement level possible. The requirement must be ambitious, but also achievable. It must thus give a real environmental benefit in relation to the standard in the industry. Here, it will be possible to convert the requirement level for the final concrete in relation to the concrete's content of the cement mix.

After the consultation, an alternative to the requirement of 70% cement clinker, alternative B, has been added. Here, it is possible to recognise concrete initiatives in construction where it is clear that the quantity of concrete has been reduced in relation to standard concrete construction. It is assessed that this requirement with specific initiatives will achieve high steerability in relation to handling the environmental impact from concrete in construction. The basis for this requirement is to recognise buildings that have reduced the environmental impact for the concrete structure in relation to the standard. The construction types that are recognised are those which include the structure in question.

[110] Low-carbon concrete, Publication no. 37, Norwegian Concrete Federation, 2015.

Cement clinker is the main constituent of cement, see footnote[111]. The EU's BAT report for cement production from 2013 has located various measures to reduce the environmental impact from the cement clinker production, which e.g. includes energy consumption as an area. This also describes how a method of reducing both the energy and climate impacts of cement production is to reduce the actual cement clinker content in the final cement mix[112].

Several concrete producers make considerable efforts to reduce CO_2 emissions and energy consumption. Here there are 3 overall initiatives:

- The most effective reduction is achieved by reducing the cement clinker content in the cement mix and thereby also in the concrete. Cement clinker accounts for the greatest energy and CO_2 impact from concrete and other cement-based products[113]. This is by e.g. using industrial residual products with cement-like properties. Ground limestone dust can also be used to save cement clinker.
- Another common method is to optimise the concrete recipe with the help of packing analysis or similar, so as to use as little cement as possible. Via materials development, industrial residual products such as fly ash and micro silica have become normal component materials in concrete. The success of these residual products is also due to how they help to improve the concrete's strength and durability.
- A third way of reducing the environmental impact is to ensure that the overall (cradle to gate) energy and climate impact from the cement or concrete is low.

Manageability for the 3 aforementioned initiatives
1 and 2: Cement clinker is defined in the "EN 197-1 Cement - Part 1: Composition, specifications and conformity criteria for common cements" standard as a hydraulic material which shall consist of at least two-thirds by mass of calcium silicates, the remainder consisting of aluminium and iron containing clinker phases and other compounds. As the clinker cement ratio is an important parameter for the functional characteristics of the final concrete, this information concerning the clinker cement content is included in the rest of the product chain. The actual cement mix is classified in various classes in accordance with the EN 197-1 standard, according to the content of cement clinker. It will thus be most natural to make requirements of the final cement or concrete product, where the clinker cement may have been replaced with alternative materials.

The EN 197-1 standard defines 27 types of ordinary cement, distributed on 5 main types (CEM I –V). CEM I, which is Portland cement, contains 95-100% cement clinker, but the content for the other types ranges from CEM III blast furnace cement with 5-19% clinker to CEM II Portland micro silicate cement with 90-94% clinker. This shows that there is very great variation in the clinker content, according to the type of cement. The EN 206 standard defines 5 exposure classes for cement, describing where the various cement types can be used. It would, for example, thus not be possible to use CEM III blast furnace cement with 5-19% clinker for all purposes. Since the requirement is made as a point requirement (and thus not obligatory) and points are given for less than 70% clinker, it is assessed to be realistic that points can be gained for this requirement. Several

[111] Cement clinker is an intermediate product in the production of Portland cement. It consists of small particles of 3 - 25 mm produced by the sintering of limestone and aluminium silicate. The particles are then cooled and sent on for grinding and mixing with other elements into the final product.
[112] EU BAT conclusions on industrial emissions for the production of cement, lime and magnesium oxide 2013.
[113] EU BAT conclusions on industrial emissions for the production of cement, lime and magnesium oxide 2013.

types of CEM II cement have the requirement of at least 65% clinker, and CEM III, IV and V even lower.

3: For Nordic Ecolabelling a challenge is seen in setting requirements of, for example, the overall climate impact of the cement or concrete. The documentation available for the cement's climate impact is usually EPDs. At the present time EPDs cannot be accepted as documentation of the climate impact, because EPDs most often use generic data for the actual cement clinker production. This means that no manageability is achieved for the part of the life cycle with the greatest energy/climate impact. At the same time, various electricity mixes are used in the EPDs, which mean that data in the EPDs cannot be compared. Electricity mix can vary considerably in the element of renewable energy and thereby the factor used for greenhouse gas emissions, expressed as Global Warming Potential (CO_2-eqv). In the EPD review by Østfoldforskning in Norway the following different electricity mixes are stated:

- Low - future requirement of EPD-Norway: 0.024 kg CO_2-eqv/kWh
- Medium – Nordic electricity mix: 0.126 kg CO_2-eqv/kWh
- High – used by klimagassregnskap.no: 0.356 kg CO_2-eqv/kWh

If these parameters are changed in the future so that the climate impact stated in EPDs is comparable and draws on production-specific data, the EPDs can be a good basis for a future climate requirement. See further information concerning EPDs and their content in section 3.6.9.

The industry's environmental work
24 international cement producers are involved in the Cement Sustainability Initiative (CSI) to reduce the environmental impact of cement, among other things by reducing the use of cement clinker in their products. Heidelberg Cement, a member of CSI, write in their sustainability report for 2013 that they are now down to an average content of 75% cement clinker for their production. There is also potential to use EMC (energy-modified) cement, to achieve very low clinker content in the cement. In this respect there are cement products in the market such as EMC70f with 70% fly ash and EMC50q with 50% silica fume.

Using alternative resources in cement mixes and concrete is not new, and over the last 20 years it has been tested whether e.g. using fly ash can present problems in relation to possible reduced content of problematic metals in the fly ash. Several tests have been performed which have shown that metals in the cement are bound in the concrete's calcium silicate structure and are not released from the product in this form[114, 115]. In Danish concrete there will typically be a content of residual products equivalent to 20% of the cement content[116].

[114] Germaneau B., B. Bollotte, C. Defossé. 1993. "Leaching of Heavy Metals by Mortar Bars in Contact with Drinking and Deionized Water." Association Technique de l'Industrie des Liants Hydrauliques (ATILH). Paper for the Portland Cement Association Symposium – Concrete in the global environment.10 March 1993.
[115] European Committee for Standardization (CEN). 1999. A study of the characteristic leaching behavior of hardened concrete for use in the natural environment. Report of the Technical Committees CEN/TC51 and CEN/TC 104. Final Draft, 59p.
[116]

In Norway, concepts such as low-carbon cement and environmental concrete are used, and these are subject to such requirements as maximum CO_2 emissions (approximately 200 kg/m^3 concrete) and a requirement of recirculated aggregate of around 25%.

After the consultation
During the consultation there were comments on the proposed cement and concrete requirements. Among other things, there was a response concerning the proposed requirement level of maximum 70% cement clinker. The responses were that it is uncertain whether this is the right level, with some parties believing that the requirement is too stringent. Svensk betong writes in its consultation response that this requirement is too high, and it must be over 83%, and NCC Denmark believes that it should lie between 85 and 95%. If the requirement level is changed to 85 to 95%, the environmental benefit achieved will be difficult to localise, since this will include most standard products in the market. NCC Sweden, Norway & Finland state that the level is fine, and even perhaps a requirement that is easy to fulfil. It seems that the supply of cement products varies and that within the various regional areas the supply is nonetheless so limited that there is no great potential in relation to choosing the products with the lowest cement clinker content. This potential may increase and become more visible over time, since several cement producers are working to develop cement products with lower cement clinker content. But the industry does not seem to be ready yet.

In the consultation responses it is also proposed that instead the requirement should be made of the final concrete, and not of the constituent cement compounds. This would recognise the measures taken with regard to the concrete recipe, where it is also possible to replace cement clinker with less energy- and CO_2-demanding materials. However, no-one has been able to suggest which requirement level it would make sense to set at concrete level. The need for cement clinker content in the final concrete depends on the specific function of the concrete in the building. This includes such parameters as the actual structure and thereby its need for strength, and the concrete's exposure in relation to the surroundings (the concrete's exposure class). It is thereby not assessed to be possible to set the requirement as a general requirement of the final concrete product.

Svensk Betong proposes that instead we should require specific EPDs for the concrete (i.e. not average EPDs). The Confederation of Finnish Construction Industries proposes adjustment of the requirement so that it governs the concrete and preferably the concrete used in the overall construction.

It has been assessed whether a requirement could be set for calculation of the overall CO_2 load from the concrete in construction, based on EPD data. Based on the status of the use of EPDs for concrete in the Nordic region, it has been assessed, however, that this is not the solution at the present time. Even though the EN 15805 standard applies to the preparation of EPDs for construction products, the EPD system is not mature enough for it to be used for the selection of the environmentally best cement and concrete products with regard to the ecolabelling of construction. For example, a common PCR for concrete and cement products is not used throughout the Nordic region. If the EPDs used are not prepared on the same basis, it is not relevant to compare them.

Two alternatives were presented for NKG:

1. That there is no requirement.

2. That two points are still given, but that the requirement is amended from giving credit to cement compounds and concrete with low cement clinker content, to giving credit for specific measures to reduce the use of concrete in construction. Here, specific measures must be defined, such as peripheral foundations, hollow core slabs, etc.

After the consultation, the requirement has been supplemented with an alternative way of scoring points (part B). This part includes requirements that give credit for specific measures in construction where it is clear that the amount of concrete is reduced in relation to standard concrete construction. It is assessed that at the present time, this requirement will achieve best steerability in relation to handling the environmental impact from concrete in construction. The basis for this requirement is to recognise buildings that have reduced the environmental impact for the concrete structure in relation to the standard. The construction types that are recognised are those which include the structure in question. If the peripheral foundations are included on the list, the inclusion of this concrete structure will also give points for a timber building and brick building.

The other possibilities investigated entailed considerable uncertainty in relation to where the requirement level should lie to have a positive effect, and also great uncertainty in terms of using EPD data as documentation. It was therefore difficult to assess whether the requirement would have any effect. Therefore, a requirement is proposed whereby it is generally known that using the construction solutions stated, the amount of concrete will be reduced in relation to a standard concrete structure.

Since points are either taken in part A or part B, the point requirement can in total give maximum 2 points.

P7 Timber structures

For buildings with renewable materials in carcass or façade the following points are given:

- Bearing systems/joists of wood or other renewable material give one point.
- Bearing walls or bearing roof structures of wood or other renewable material give one point.
- Façades for which more than 50% of the façade area is of maintenance-free wood or another maintenance-free renewable material give one point.

A maximum of 2 points can be achieved.

✉ A description of the building or building type's materials in the carcass/bearing structure, roof structure and façade, see also O1.

✉ For maintenance-free façades, the manufacturer must give a written undertaking that it is maintenance-free for at least ten years, in normal conditions.

Background

Recognition is made of the high use of renewable resources in construction, normally as buildings with timber structures and timber façades. The timber resources in the bearing structure constitute the largest renewable resource in a building. In most cases it will therefore be the choice of material type for the structure that among other thing will determine whether there is a high or low content of renewable resources in the building structure.

Greater use of renewable materials generally gives a generally lower resource and energy (including climate) impact from the building structure. In the LCA study "Life Cycle Assessment of Different Building Systems: The Wälludden Case Study" it is seen, among other thing, that a building structure with an original concrete carcass uses more energy for materials production and construction of the building structure than for a building structure with an original timber carcass. Viewed overall for both production and construction, the energy consumption is 1052 kWh/m^2 and 810 kWh/m^2, respectively, for the two building structures. Timber-based construction thereby has an energy consumption that is 23% lower in these two phases[117]. At the same time, the study entitled "Carbon, Fossil Fuel and Biodiversity Mitigation with wood and forests" shows that the greatest reduction of CO_2 emissions and fossil fuels on using timber resources is achieved by substituting steel and concrete with timber resources[118].

Additional to this is the lower burden on resources from using renewable resources such as timber. It is important, however, to ensure that the renewable resources used are still sustainable. The criteria therefore set stringent requirements of the use of a high ratio of certified sustainable wood in construction - see requirements O27 and O28.

P8 Better noise environment (solely concerns small houses and apartment buildings)

For residential buildings, points are given as stated below.

1 point is given if the building fulfills:

- Recommended supplementary requirements for low frequencies concerning impact noise and/or airborne noise according to the national acoustic environment standard, in combination with sound class C. Applies to Denmark, Norway and Finland.
- Sound class B for two optional acoustic environment parameters. Applies to Sweden.

3 points are given if the building fulfills:

- Sound class B for two optional acoustic environment parameters. Applies to Denmark, Norway and Finland.
- Sound class B for the overall Nordic Swan Ecolabelled building. Applies to Sweden.

National noise standards: Denmark DS 490, Sweden SS 25267, Norway NS 8175 and Finland SFS 5907.

✉ Planning/projecting of acoustic level/sound protection stating the sound class designed. The planning/projecting must be performed by an acoustic technician or another person with equivalent competence.

Background

How buildings should be designed to ensure that noise does not disturb residents or people close to the building is a highly relevant indoor environment question. Many surveys have shown that noise is one of the indoor environmental disturbances that are experienced as the biggest nuisance.

[117] "Life Cycle Assessment of Different Building Systems: The Wälludden Case Study", SP Technical Research Institute of Sweden in 2013.
[118] Chadwick et al. Carbon, Fossil Fuel and Biodiversity Mitigation with wood and forests, Journal of Sustainable Forestry 2014.

Noise disturbance can have a great influence on both physical and mental health. Road traffic noise entails an increased risk of thrombosis or suffering a stroke, and an increased risk of developing diabetes. The Danish Environmental Protection Agency estimates that approximately 785,000 flats are exposed to external noise at levels that exceed the official indicative threshold. This is equivalent to approximately 25% of all flats in Denmark.

The standards in Sweden, Denmark, Norway and Finland divide the noise environment into four noise classes, where C is equivalent to the statutory level. Noise class B corresponds to one class better than legislation and must ensure good noise conditions. Sound parameters included in several standards are: noise from technical installations, insulation from external noise sources, airborne noise insulation between residential units, impact noise level and reverberation time.

There are variations between the national standards, which noise parameters are included, and which threshold values apply. See Table 8 which shows the requirements for noise class C in all of the Nordic countries. But since it is variations in how the parameters are presented and calculated, comparisons are difficult to make. For the parameter 'impact noise level' the variation is greater. The threshold in Swedish noise class A approximately represents the other Nordic countries noise class B. There can be differences according to size of room.

Table 8: Noise classes for various types of buildings in the Nordic region. Downloaded from a lecture by Iiris Turunen-Rindel, Standards Norway, October 2013[119]

Romtype	Norge NS 8175 (2012)	Sverige SS025268/25267(2004)	Finland SFS 5907 (2004)	Danmark DS 490 (2001)/ BR 2008	EN 15251 (2007)
Soverom, oppholdsstue	30/32 25/27 (service) RC= 30 dB -7 dB	30/35 + 1/1 oktavbånd lavfrekvent krav	28/33	30 50 dB (C-veid)	26/32
Barnehagerom	30/32 RC= 30 dB -7 dB	30 45 dB (C-veid)	28/33	≤ 30	30-40
Undervisningsrom	28/30 RC= 28 dB -7 dB	30 45 dB (C-veid)	33/38	≤ 30	35
Sykehus, sykerom	28/30 RC= 28 dB -7 dB	30 50 dB (C-veid)	28/33		30-40
Kontor	33/35	35 55 dB (C-veid)	35	40 (fra 1984)	35 40 (landskap)
Hotellrom	30/32 RC= 32 dB -7 dB	30 50 dB (C-veid)	28/33		30-40
Skolelandskap	28/30	30 45 dB (C-veid)	(landskap eksisterer ikke)		(eksisterer ikke)
Restaurant	35/37	40 60 dB (C-veid)	38/43		40-45

New updated editions of the Swedish standards SS 25267 for dwellings and SS 25268 for premises will come in 2014 and 2015, respectively.
RC= room criteria.

For consultation, an obligatory sound environment requirement was tested. But due to the differences between, first of all, the Swedish sound standard and other Nordic

[119] Iiris Turunen-Rindel: Lydklasser for bygningertyper (Noise classes for building types) NS 8175:2012, Standards Norway - NAS meeting (Norwegian Acoustics Society), Trondheim 2012-10-25 Downloaded from: http://www.norskakustiskselskap.org/uploads/hostmote/2013/fredag/Lydklasser%20for%20bygningstyper%20NS%208175_universell%20utforming%20endelig_2013-10-24.pdf (16.01.2015).

countries' equivalent standards; instead the requirement has been converted to a point requirement.

The assessment is that it is possible to achieve sound class B if this aspect is included early in the project, so as to plan according to this, and that the development is also towards quieter installations. With the freedom of choice/flexibility in the obligatory requirement, Nordic Ecolabelling avoids the requirement clashing with the use of room (ventilation) aggregates with open-plan space between kitchens and living rooms, as well as possible difficulties for a timber building in achieving impact sound level B.

To achieve three points in Sweden, the Nordic Swan Ecolabelled building must achieve sound class B overall. This means that the reverberation time, which is included as a sound parameter in the Swedish SS 25267 standard, if there is a corridor or stairwell, must also achieve sound class B. This is good, especially since the requirement of sound insulation from the stairwell is partly linked to the reverberation time requirement.

The national standards prescribe which types of rooms are to show which decibel levels. This does not need to be specified in the Nordic Ecolabel requirement. The requirement must be verified with a sound survey/a document often created in project design to show calculated sound levels and designed sound class. The survey must be performed by an acoustic technician or another person with equivalent competence.

P9 Ecolabelled construction products

Ecolabelled (Nordic Swan Ecolabel or EU Ecolabel) construction products used in the Nordic Swan Ecolabelled building give points.

For each product category:

- 1 point is given if at least 10% of the product requirement is covered by ecolabelled products;
- 3 points are given if at least 50% of the product requirement is covered by ecolabelled products.

Appendix 13 designates the division of product categories. A maximum of 10 points can be achieved.

✉ A list of ecolabelled products with related licence number and share of the product requirement. Appendix 13, which manages the division of product categories, must be completed.

Background

The construction materials contribute environmental impacts such as energy consumption, resource consumption, problematic chemical impacts and negative impacts on biodiversity. The ecolabelled construction materials set requirements of many environmental parameters where there is a relevant environmental impact throughout the product's life cycle that can be reduced and documented in relation to ecolabelling.

It is important that a Nordic Swan Ecolabelled building uses some of the building products with a reduced environmental impact that are available in the market. There are more and more construction materials with type I ecolabels such as the Nordic Swan Ecolabel and the EU Ecolabel in the market, and it is thus obvious to encourage their use in Nordic Swan Ecolabelled buildings. The advantage is that the ecolabelled (type 1) construction materials fulfil environmental requirements that address the environmental impact throughout the product life cycle, where possible. Behind this lies extensive

documentation of the product's environmental performance. Using ecolabelled materials in construction is thus an easy way to ensure environmentally sound materials without this entailing a lot of new documentation.

The requirement has been changed since the previous version, in order to increase the motivation to use ecolabelled materials. In this respect a total of 10 points can be achieved, where it was previously only possible to achieve a total of 5 points for ecolabelled products. In addition, it has been made possible to achieve 3 points if more than 50% for a product type is used. The product types are defined in the Table in Appendix 13 and this has how been expanded with the product areas of façade panels, outer doors, playground equipment, tool sheds, bicycle sheds and sanitary fixtures.

To ensure that there is no doubt as to how the various types are to be distinguished or held together, the breakdown in the table to Appendix 13 of the criteria is used.

P10 Conscious product choice

Substitution of environmentally and health hazardous substances in products give points as stated below. A maximum of 2 points can be achieved.

- If all expansion joints with the highest demand on flexibility is phthalate free, 2 points are given.
- If all conduits are PVC-free and contain a maximum of 0.05 weight% bromine and chlorine respectively, 2 points are given. The content must be verified with ion chromatography method as specified in EN14582.
- If all products within one of the following product categories are PVC-free, 1 point is given:
    - Drainage pipes
    - Heavy current cables
    - Plastic pipes for central vacuum cleaners

See Appendix 8 for what is included in the product categories.

Regardless of point-score the compulsory requirement O22 must of course also be met.

✉ Documentation from the licence applicant and from manufacturers of plastic products.

Background

The requirement is unchanged from version 2 as this has proved to be appropriate and well-functioning. Nordic Ecolabelling has considered making the requirement obligatory but decided to continue with this as a point requirement since the preconditions for choosing PVC-free may vary. One reason might be that some PVC-free products are still a little more expensive, which can lead to unacceptable additional costs for a project. Nordic Ecolabelling has also received information from licensees that it can be difficult or impossible to use PVC-free drainage pipes if they are laid in the ground during winter at low temperatures. It is not unusual in a project with an environmental profile to require PVC-free alternatives to a number of plastic products, and the supply has increased while prices have fallen.



Figure 6: Conduits, empty or pre-filled with cables and mounted in walls and ceilings.

The decision by the Nordic Criteria Management Group on 14 December 2017 was followed by the introduction of two new points options and the name of the requirement was changed to Conscious product choice to better describe the extended scope. Nordic Ecolabelling has become aware that a phthalate-free expansion joint is now available in the market and it wants to be able to reward this with a point option. The phthalate-free expansion joint has passed the requisite tests and has the highest modulus of elasticity (25%). The standard 2-year warranty applies, and an extended warranty period of 5 years is offered if the installing contractor is licensed.

Nordic Ecolabelling has also become aware that electrical cable conduits in the market contain varying concentrations of brominated flame retardants. A point option for electrical cable conduits with very low concentrations of brominated flame retardants is being introduced to reward this. There are a few manufacturers whose products meet this requirement. It applies to traditional electrical cable conduits made of polypropylene (PP) as well as PPE/HIPS blends which do not require any flameproofing with brominated flame retardants.

The possibility of gaining points for PVC-free power pipes was removed on 31 January 2018 in order not to risk a conflict with Nordic Ecolabelling requirements for brominated flame retardants (requirement O22). PVC-free electrical pipes always contain a certain amount of brominated flame retardants.

The reason for the requirement conflict is that electrical installation cables must be flame retarded. Brominated flame retardants are used almost in all products, sometimes in combination with antimony trioxide.

See requirement O22 concerning what is included in the various product categories. In section 5.2 "What is covered by the requirement" the delimitations are described between the conduits and cables with Nordic Ecolabelling requirements and those that are not subject to our requirements. Installations up to the building are not covered by the Nordic Ecolabelling requirements. This means, for example, that electrical main lines on building exteriors and their wires up to the main fuse cabinet, and sewerage pipes up through the base to connecting conduits from inside are not included. On the other hand, sewerage pipes and cables and electrical conduits inside the building are included and can give points according to this requirement.

P11 Wooden mouldings from certified forestry

Solid wooden mouldings certified as sustainable forestry according to FSC or PEFC can give points.

- If at least half of the need for wooden mouldings (mouldings, skirtings, baseboards, level drops and similar) is covered by certified timber products, one point is given.
- If the entire requirement is fulfilled by certified timber products, two points are given. This applies to interior moldings such as floor moldings, floor skirting boards, level wood strips, door and window skirtings, window boarder mouldings, ceiling moldings, border moldings, joint moldings dado rails, door frames and treshholds.
- Door frames and thresholds are not included

Maximum 2 points can be achieved.

Chain of Custody certification

The supplier of wooden mouldings must be Chain of Custody certified by the FSC/PEFC schemes.

Suppliers who only deliver recycled material in the Nordic Swan Ecolabelled buildings are exempted from the requirement to Chain of Custody certification.

Certified wood raw material

A minimum of 70% by weight of the wood raw material in the mouldings must origin from forestry certified under the FSC or PEFC schemes or be recycled material.

The remaining proportion of wood raw material in the mouldings must be covered by the FSC/PEFC control schemes or be recycled material*.

Half of the need is calculated and documented in a suitable way depending on the product type, for example moldings by the metre or in terms of volume.

** Recycled material defined according to ISO 14021, see requirement O28.*

✉ For documentation, see requirement O28.

Background

This point requirement complements the obligatory requirement of timber from certified areas in Nordic Swan Ecolabelled buildings (O28). The obligatory requirement comprises the large elements that may be of timber in a building, such as roof trusses, frames and beams, interior panels and exterior facades.



Figure 7: Wooden mouldings from certified wood give points.

The point requirement includes wooden moldings (interior moldings). Moldings includes floor moldings, floor skirting boards, level wood strips, door and window skirtings, window boarder moldings, ceiling moldings, border moldings, joint moldings dado rails, door frames and thresholds. and dividing frames. Like requirement O28, the requirement is aimed at increasing the use of timber from certified areas that guarantee sustainable cultivation in both environmental and social respects.

Naturally, other construction products and timber fittings are also used in a Nordic Swan Ecolabelled building, such as windows, doors, floors, kitchen fixtures, stairs and construction panels. There are Nordic Swan Ecolabelled alternatives within all of these product groups and these are instead credited under requirement P9, which gives points when Nordic Swan Ecolabelled or EU Ecolabelled construction products are used.

P12 Recycled or reused materials in building products

For each construction product and construction material outside the vapour barrier consisting of at least 25% recycled or reused raw material, 1 point per product is awarded. A maximum of 3 points can be achieved.

Points are not awarded for the following construction products where recycling of material is already established: metals, insulation (glass wool and cellulose), industrial gypsum and wooden fiber products. Reused raw material or products are however not limited.

The recycled resource may not contain any of the following substances at a level >100 ppm:

- halogenated flame retardants
- highly chlorinated short chain (C10-C13) and medium chain (C14-C17) chlorinated paraffins

- cadmium, lead, mercury, chromium VI and arsenic, and compounds of these substances.

For buildings constructed without the need for vapour barrier, products made of recycled material shall still not be for indoor use.

✉ Documentation showing the ratios of recycled resources in construction products or materials.

✉ Documentation of the occurrence of the substances listed in the requirement, for example via an analysis report.

Background

Buildings and construction use many resources and produce large quantities of waste. The building sector alone accounts for 40-50% of the world's consumption of resources. The revision examined whether requirements can be made that can stimulate the greater use of construction materials with recirculated resources. On using recirculated resources, the resource, energy and CO_2 impact from the product may often be reduced significantly. However, this will vary according to the type of material that is recirculated. The drawback is that recirculated resources often have poor traceability in terms of the constituent substances in the resource. This can make it difficult to document whether the material contains problematic substances. These substances are unwanted in relation to degasification to the indoor environment and are not wanted in the materials cycle either. Reuse is one of the top levels of the waste hierarchy and is therefore often related to a reduction of the environmental impact of the building product. Nordic Ecolabelling has examined whether it is possible to promote the reuse of construction materials, possibly with a point requirement that rewards the use of recycled construction products.

Nordic Ecolabelling wishes to contribute to the development of the recovery of construction materials in order to reduce the environmental impact from a life cycle perspective. Society's need for natural resources is increasing, making it important to close the circle and see used products and materials as a raw material for new products and materials. The challenge of detoxifying the cycle must also be handled. Nordic Ecolabelling is therefore making the fundamental requirement of recovered resources and recycled products that they are documented to be free of a number of listed health- and environmentally hazardous substances, see the requirement. This can e.g. be verified via chemical analysis of the recovered resources.

Only construction products and construction materials outside the vapour barrier are included in the requirement. Even if recovered or recycled materials are free of the substances listed, Nordic Ecolabelling wishes caution to be exercised concerning recovered materials that are in direct contact with the indoor environment.

P13 Recycling of building waste

If the ratio of building waste from the construction process that is recovered or is subject to recycling of materials is:

- 50% or higher 1 point is given
- 60% or higher 2 points are given
- 70% or higher 3 points are given.

A maximum of 3 points can be achieved.

The waste that is collected unsorted at the construction site, but which on subsequent sorting could be recycled, can be included in the ratio, if the recycling can be documented in writing.

Building waste is defined as waste occurring in conjunction with construction (work). Waste that occurs when buildings or parts of buildings are torn down is defined as demolition waste and is not normally a part of the calculation according to the requirement.

☒ Documented waste volumes that are sorted and collected for recovery or recycling in relation to the total volume of building waste occurring.

☒ Contract with waste collectors supporting the possibility to recycle the materials or to reuse the waste fractions.

Background

The building sector is often called the 40% sector. By this it is meant that 40% of waste arises in the building and construction sector and 40% of the hazardous substances in all waste are found in building and demolition waste. Recycling (reuse) and recovery of materials from non-hazardous building and demolition waste must, in accordance with the EU Waste Framework Directive (2008/98/EC), increase to at least 70% by weight in 2020. It is thus highly relevant to make requirements of sound waste handling in the building process with the aim of minimising the waste volumes occurring, sorting the waste to allow for recovery of materials, and handling any residual volume correctly, whether this is as hazardous waste or for landfill.

Reducing the waste occurring in buildings concerns systemically preventing waste, rather than measures for the actual waste stages. Important measures (not ranked) to prevent waste are[120]:

- Design of the buildings to standard measurements
- Selection of materials to reduce hazardous waste
- Building methods and use of prefabricated elements
- Logistics and materials handling to reduce volumes of defective materials and reduce loss
- Quality work to reduce the volume of building defects and damage to completed elements.

Details of waste volumes are uncertain and vary considerably from project to project. Svenska Miljöstyrningsrådet (Swedish Environmental Management Council)[121] states the figure of 25-30 kg waste/m^2 for new production. The costs of disposal of unsorted waste mean that there are strong economic incentives, besides the environmental incentives, in favour of sound waste handling. Even though it is most relevant to have requirements such as minimising waste volumes, Nordic Ecolabelling's access to manage this is very low.

The point requirement in the previous version of the criteria (P8) made it possible to achieve a point if more than 3 waste fractions are sorted at the construction site. The content already exists, but the requirement has been re-formulated. A point is given if at least 50% of the construction waste arising during the construction process is handled and sorted, so that it can either be recycled or the materials can be recovered. Two points

[120] Att minska byggavfall-en metod för att förebygga avfall vid byggande (Reducing building waste - a method to prevent waste from buildings), Thyréns 2012.
[121] Miljöstyrningsrådet's procurement criteria for contractors' new construction of premises in 2009.

are given if the share of recycled or reused is 60% and in total 2 points are given if the percentage share is 70% or more. The last-mentioned level, corresponds to EUs aim in the Waste Directive. Note that the requirement does not cover the incinerated waste (energy recovery). Due to different circumstances for every project, the requirement must be verified every time points are wished for.

Of course, landfill and waste incineration are not defined as material recycling.

The licensee does not have control/access to how the sorted waste is finally handled by the waste contractor. Waste that has been sorted for recovery of materials can nonetheless still be incinerated. The requirement is therefore deliberately worded so as to concern how the waste has been sorted by the licensee/at the construction site, and not how it was finally disposed of.

If much of the work is done by a prefab manufacturer it is possible to include waste at this manufacturer, although this is voluntary.

P14 Green initiatives

Points are given for innovative measures taken in the construction process. A maximum of 3 points can be achieved. The list below shows the measures that are awarded points. For a more detailed description, see Appendix 14. Other measures can be accepted after decision by Nordic Ecolabelling.

Ecosystem services

- Green roofs and façades, i.e. spaces used to grow plants*.
    - 1 point if the green area exceeds 10-25% of the total roof and façade area.
    - 2 points if the green area exceeds 25% of the total roof and façade area.
- Local disposal of surface water** (1 point).
- Opportunities created for urban cultivation, such as via cultivation boxes (1 point).
- Creation of gardens for biological diversity (1 point).
- Creation of habitats for insects, birds and bats (1 point).

Environmentally friendly transports:

- **Making it easier to use bicycles as a means of transport with:**
    - Indoor bicycle workshops for residents. (1 point)
    - At least 1.5 bicycle parking spaces per flat are provided and equipped with access to frame locks (1 point). Bicycle stands alone are not deemed to be an innovation.
    - At least 50% of bicycle parking is weather protected (1 point)
- At least one parking space is equipped with access to charge electric vehicles (1 point).

Energy-related measures

- Exterior solar protection (fixed or movable) on all south-facing windows (1 point).
- Intelligent monitoring and display of the residential unit/preschool/school's energy consumption (1 point).
- Introduction of the possibility of energy storage in the building, for flexibility between high-load and low-load situations (1 point).

- All white goods within a product group are connected directly to the district heating network or the domestic hot water network (1 point).

** Species listed in CITES, Annexes I, II and III, may not be used in Nordic Swan Ecolabelled buildings. See the website "The CITES Appendices" www.cites.org/eng/app/index.php*

*** Green roofs/façades cannot also give points as measures for local disposal of surface water.*

✉ Documented description of measures.

✉ Regulations for the Nordic Ecolabelling of products

Background

Nordic Ecolabelling will reward innovations in Nordic Swan Ecolabelled construction projects. Innovations that give points are primarily related to ecosystem services/biodiversity, but measures to make it easier for residents to use bicycles rather than cars as a means of transport will also give points. So as not to be indicative but not completely controlling either, a list has been drawn up to state what gives points, and how many. Whether other innovations are relevant must be assessed by Nordic Ecolabelling before a decision concerning points is taken. Even if several innovations can take place in a project, which are added together, maximum 3 points can be achieved for this point requirement.

Biodiversity

There are many benefits from (increased) biodiversity, also in urban environments. Some are more direct such as treatment and storage of rainwater, entailing cleaner rivers and tributaries to wetlands and lakes. Other effects are a reduced risk of flooding or at least less serious consequences of torrential rain. Green roofs channel the water flow to the surface water system and even out the load on the treatment system. Several nature types increase the city's biodiversity, improve the air quality and improve conditions for pollinators.

Biodiversity in city environments is also important to the social dimension of sustainable development. Biodiversity in the city is a way for children in city environments to be in contact with nature, which does not always happen in other ways. Nature is beautiful and positive for people's well-being and gives us value even when it has not been converted into useful products. To avoid very small green spaces giving points, the lower limit is set as 10%.

Local disposal of surface water

Local disposal of surface water is when conditions are created to handle own surface water (rain, flushing and melt water) that runs on streets and other hard surfaces and in ditches to lakes, watercourses or treatment works. Measures are often to lead the rainwater to local filtering instead of to surface water drains. Parking spaces may, for example, be designed with grid pates to make them permeable.

Transport

Nordic Ecolabelling will reward measures to simplify and encourage the use of bicycles as a means of transport. It is therefore possible to get points for various measures related to this.

If car parks are equipped with at least one charging station for electrical vehicles, 1 point is also given.

Exterior solar protection
Solar radiation through a window may become excessive and lead to excessive heating, especially in the summer months. If excessive heating is cooled off or removed by increased ventilation, this increases energy consumption. Not only the direct solar heating that needs to be screened off, but also the secondary heat output that occurs when sunlight penetrates the windowpane and becomes long-wave heat radiation. The idea is to use exterior sun protection to contribute to reducing the risk of excessive indoor temperatures. This is most relevant for south-facing windows, so that the requirement is limited to this.

Exterior solar protection gives the very best screening. This may be either fixed or adjustable. Fixed screens may be eaves, overhanging balconies, niches and canopies. Adjustable exterior sun protection may be awnings, exterior sunshades, screens and related products. Special windowpanes or foil on windowpanes that clearly reduce the sunlight's penetration through the pane are accepted.

Blinds installed between windowpanes are the most common type of sun protection. However, blinds located in this way will absorb a large part of the radiating heat, which increases the secondary heat through the window. Blinds between windowpanes have great value to protect privacy and are common in flats. On the other hand, they are not covered by the point requirement. Interior solar protection such as curtains, roller blinds or interior blinds gives the poorest screening and is not subject to the point requirement either.

White goods
It is possible to rationalise the consumption of high-grade electrical energy for white goods by using energy from existing heating system, primarily in two ways:

- Connecting white goods directly to the district heating network, which is the most effective way.
- Connecting white goods to the domestic hot water network, which is a technology that for a number of years has been provided by several manufacturers in the Nordic market.

District-heating supplied white goods are based on how the hot water circulates through heat exchangers built into the machine, to provide heating, instead of an electrical battery as in conventional machines (standard design). In this way, the electricity requirement for heating, which accounts for most of the machine's energy use, can be replaced with district heating. The environmental improvement both optimises electricity use and reduces energy. Surveys show that the electrical energy reduction is in the range of 80 - 90% for washing machines and dishwashers, and up to 80% for tumble dryers[122].

How much less energy is used by connecting white goods to the domestic hot water network depends on how the hot water loop is connected. According to calculations by ASKO Appliances, dishwashers and washing machines that are connected to the hot water supply use approximately 306 kWh less energy per year than today's consumer machines that are connected to the cold-water supply as standard. There are several manufacturers in the market that offer white goods which can be connected to both the

hot and cold-water supply. The Swedish District Heating Association's website[123] presents several models, and the electricity savings lie between 20 and 60%.

Intelligent monitoring and display of energy consumption
Intelligent monitoring and display of buildings' energy consumption can help to reduce the total energy consumption. These systems can lead to greater user awareness regarding consumption and thereby help to reduce total consumption and also possibly move consumption away from peak load times on the network.

Energy storage in buildings
Energy storage in a building can help to move energy consumption from high-load situations to low-load situations. This will make it possible to store energy from energy surplus periods for consumption periods. Overall, this will reduce the need for purchased energy and reduce consumption of energy resources.

6 Changes compared to previous version

Appendix 1 lists the most important changes compared to the previous version.

7 New criteria

- Review of energy requirements in terms of buildings, white goods and other energy-related products.
- Review of materials requirements.
- Continued focus on energy requirements of materials.
- Requirements concerning metals, to increase recovery.
- Limitation of lead in water taps to minimise the risk of leakage.
- Review of point requirements.
- Review of the exception for phthalates in expansion joints

[123] Technology tested at Fjärrvärmehuset (district heating house) in Gothenburg, and at Karlstad University. See http://www.svenskfjarrvarme.se/Medlem/Fokusomraden-/Fjarrvarldens-omvarld/Energieffektivistering/Energieffektiviseringsexempel/Bostader/vitvaror/

Appendix 1 Changes compared to the previous version of the criteria

The table below summarises the requirements and how they have been changed in conjunction with the revision.

Previous criteria (version 2.11)	Revised criteria (version 3.0)	Comments in relation to proposal 3.0
O1	O1	**Overall description of the building** Unchanged in principle
O2	O2	**Responsibility for Nordic Swan Ecolabelling** Unchanged in principle
O3	O30	**Air permeability** Requirement levels removed. The requirement concerns routines to test air permeability and has been moved to the Quality management of the building process section.
O4	O4	**Energy consumption of the building** The requirement fixes a percentage for each country in relation to the country's energy regulations for buildings. Quality requirements of energy calculation can now be found in the appendices to the criteria.
O5	O5	**Lighting management** The requirement for energy classes of lighting has been removed. A requirement of automatic presence control has been introduced for communal areas in apartment buildings. The point requirements for presence control of lighting in pre-schools (P4) have been revised to obligatory requirements for schools and pre-schools.
O6	O6	**Energy-efficient white goods** The requirement for energy classes of white goods has been tightened.
O7	P5	**Sanitary tap ware** The requirement has been converted to a point-score requirement and refers to emery labelled sanitary fixtures.
O8	--	**Individual energy metering** The requirement of individual metering of heat energy has been removed. The requirement of individual metering of domestic hot water has been changed to a point requirement (P2)
O9	O11	**Ventilation** The ventilation requirement concerns function control of the ventilation system.
O10	O12	**Sound environment (solely applies to pre-school and school buildings)** Unchanged in principle
O11	O13	**Daylight** The requirement has been revised and the requirement level adjusted to be sufficiently challenging, but not impossible to achieve, and also includes schools. New requirement of daylight factor for homes in accordance with national building codes.
O12	---	**Illuminance** The requirement of illuminance that solely applied to pre-school buildings has been removed.
O13	O15	**List of materials and logbook** The requirement has been developed to also include the requirement of a logbook for the building.

O14	--	**Chemical building products, safety data sheets** The requirement of safety data sheets has been removed as a separate requirement
O15	O16	**Classification of chemical products** Unchanged in principle
O16	O17	**CMR substances** Unchanged in principle
--	O18	**Preservatives** New requirement to minimise certain preservatives in indoor paints and varnishes.
--	O19	**Preservatives** New requirement to minimise certain preservatives in other chemical products used indoors.
O17 & O18	O20	**Other substances excluded from use** Revised to avoid duplication. Otherwise unchanged.
O19	O21	**Nanoparticles** The requirement of nanoparticles in chemical products has been revised and clarified.
O20	--	**Handling of chemical products** Requirement deleted.
O21	O22	**Substances excluded from construction products, goods and materials** Some construction products have been added. The scope has been specified and documented. The list of substances has been reviewed and also refers to e.g. the Candidate List.
O22	O23	**Nanoparticles and antibacterial additives in goods** The requirement has been specified and also includes waste disposal units.
O23 & O24	O27	**Origin, legality and traceability** The requirement for timber resources has been revised to increase clarity and harmonisation with the European Timber Trade Regulation and recognition of the international forestry certification systems.
O25	O28	**Resources from controlled and certified forestry** The requirement level has been tightened from 50 to 70%. The requirement has been harmonised with new timber requirements within Nordic Ecolabelling.
O26	O29	**Durable wood for outdoor use** The requirement has been specified and also includes timber used in yards.
O27	O14	**Formaldehyde emissions** The requirement has been harmonised with the equivalent for construction panels.
O28	O26	**Copper in domestic water pipes and as façade and roof material** The requirement also includes products for roofs and façades. New requirement to minimize copper from domestic water pipes.
O29	O24	**Surface finishes on floors, roofs and walls** The requirement is in principle unchanged
O30	O25	**Windows and doors of non-renewable materials** The requirement is harmonised with the materials requirement in the criteria for Nordic Swan Ecolabelled windows and outer doors.
O31	--	**Low-flush toilets** The requirement has been removed.
O32	O7	**Possibility of sorting at source** Number of fractions increased.

O33	O8	**Waste sorting station** The requirement is in principle unchanged
O34	O9	**Radon** The scope of the requirement is in principle unchanged. The requirement has been moved to the Indoor environment section.
O35	O3	**Material requirements** Unchanged
O36	--	**Waste handling in the construction process** The requirement has been removed.
O37	O10	**Moisture prevention** The requirement has been removed.
O38	---	**Waterproof construction** The requirement is further specified, but otherwise unchanged
O39	O33	**The contractor's self-monitoring** Unchanged
O40 & O41	O34	**Inspection of the completed building** The requirement is condensed to a requirement…
O42	O3	**Points achieved** Has been moved to the introductory general requirements. The point calculation table can be found in the appendix.
O43	O32	**Information to those involved in the construction process** The requirement has been expanded with verification of training/information programme and lists of participants after implementation details.
O44	O40	**Laws and regulations** Unchanged
O45	---	**Organisation and responsibility** Removed. Instead the information is requested on the application form.
O46	O37 & O38	**Planned changes and unforeseen non-conformances** Split into two requirements. Otherwise unchanged.
O47	O39	**Complaints** Unchanged
O48	O36	**Documentation of the houses built** Unchanged
O49	O35	**Documentation of application** Unchanged
O50	O41	**Operation and maintenance instructions** Unchanged in principle
P1	--	**Reduced energy consumption** The requirement has been removed.
P2	P1	**Energy contributions from local energy sources or energy recovery** There is no change in what are deemed to be local renewable energy sources. Points are awarded according to the proportion of the energy requirement covered.
P3	P8	**Better sound environment (solely concerns small houses and apartment buildings)** The requirement is changed to better handle the national differences in the sound classes in the Nordic standards. The requirement can give more points than before.
P4	--	**Demand management of lighting** The requirement is integrated into the lighting requirement, O5
P5	P9	**Ecolabelled building products** The requirement will stimulate the use of ecolabelled products and give access to more points than before.

P6	P10	**Chlorine-free plastic products** Unchanged in principle.
P7	P11	**Timber structures** Partly a new requirement. Can give 2 points.
P8	P13	**Recovering of building waste** Reformulated from number of waste fractions to ratio of building waste that is recovered.
--	P2	**Individual metering of domestic hot water** New point requirement of individual metering of domestic hot water was obligatory in version 2.
---	P3	**Minimised hot water circulation (HWC) losses** New requirement
---	P4	**White goods in best energy class** New requirement
---	P6	**Cement and concrete with a reduced energy and climate impact** New requirement
---	P7	**Timber structures** New requirement
---	P12	**Recovered or reused materials in building products** New requirement
---	P14	**Innovations** New requirement

The marketing requirement (O50) in version 2.10 and previously has already been removed.

Appendix 2 Labels and classification systems for construction products.

The appendix is written in Danish and may be obtained from Nordic Ecolabelling: Sara.bergman@svanen.se

Appendix 3 Legislation and regulatory requirements

The appendix is written in the Scandinavian languages and may be obtained from Nordic Ecolabelling: Sara.bergman@svanen.se

Appendix 4 Relevance, potential and steerability (RPS)

The appendix is written in Swedish and may be obtained from Nordic Ecolabelling: Sara.bergman@svanen.se. A summary of the RPS-analysis is presented in section 2.2 in the Background report.

Appendix 5 National energy regulatory requirements for buildings

The appendix is written in the Scandinavian languages and may be obtained from Nordic Ecolabelling: Sara.bergman@svanen.se

Appendix 6 Radon

The appendix is written in Norwegian and may be obtained from Nordic Ecolabelling: Sara.bergman@svanen.se

Appendix 7 Moisture prevention and waterproof building techniques

The appendix is written in the Scandinavian languages and may be obtained from Nordic Ecolabelling: Sara.bergman@svanen.se

Appendix 8 Undesirable chemical substances

Substances of Very High Concern and the Candidate List

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

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

Potential endocrine disruptors Category 1 and 2
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 most significant routes for the spread of endocrine disruptors[124]. 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

[124] Miljøstatus i Norge, 2008

EU's original report on "Endocrine disruptors or later studies[125], see http://ec.europa.eu/environment/endocrine/documents/final_report_2007.pdf.

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

Short-chain chlorinated paraffins (C10-C13) and medium chain chlorinated paraffins (C14-C17).
Chloroparaffins, which are also used as flame retardants, are stable and not readily degradable compounds that can bioaccumulate in the environment. Highly chlorinated short-chain and medium-chain chloroparaffins are highly toxic to aquatic organisms and may have a harmful long-term impact on the aquatic environment. Short chain chloroparaffins have been classed as substances of a very high concern, or SVHC.

Perfluorinated and polyfluorinated alkylated substances (PFAS).
Perfluorinated substances are also called perfluoroalkyl surfactants or perfluoroallyl acids and are included in the category "halogenated compounds. (PFAS) is a designation for a group of chemical compounds which contain a completely fluorinated alkyl chain and a group which gives the compound a certain solubility in water. This group of compounds is fundamentally different from most other chemicals as it is neither lipophilic (fat-loving) nor hydrophilic (water-loving) but binds easily with particle surfaces. The compounds are mainly used for their good surface properties and water and fat repellent qualities. They are used in various industrial and consumer products, in which properties such as low surface energy, high chemical and thermal stability, low light refractive index, high electrical insulating power and good resistance to corrosion and external stresses are important. Important product types include floor wax and polish, paint and lacquer, degreasing and cleaning agents, impregnating agents for textiles and leather and fire extinguishants.

Perfluoroalkyl substances are highly persistent (stable) and slow to degrade. As mentioned above, the compounds have very low water and fat solubility, and accumulation takes place by binding to the surfaces of particles or fabric. They bind to proteins and can be detected in high concentrations in top predators. A Nordic screening study showed PFAS compounds in all examined sample types, with the highest levels in marine mammals. The report concludes that PFAS is present in significant concentrations in the Nordic environment. The highest focus is on the PFAS compound perfluorooctyl sulphonate (PFOS), which is toxic to aquatic organisms, birds and bees. /ref: SFT: 927/2005/.

APEO[126,127,128] and other alkylphenol derivatives
Alkylphenol ethoxylates and alkylphenol derivatives, i.e. substances that release alkylphenols on degradation, must not be used in ecolabelled chemical building products. APEOs can occur in binders, dispersants, thickeners, siccatives, anti-foaming agents, pigments, waxes, etc. APEOs have a host of properties that are problematic and harmful to health and environment. They are not readily degradable according to standardised

[125] 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
[126] Substitution af alkylphenolethoxylater (APE) i maling, træbeskyttelse, lime og fugemasser, Working report from the Danish Environmental Protection Agency, No. 46/2003
[127] Nonylphenol og nonylphenolethoxylater i spildevand og slam, Miljøprojekt nr. 704/2002
[128] Feminisation of fish, Environmental Project no. 729, Danish Environmental Protection Agency, 2002

tests for ready degradability, they tend to bioaccumulate and they have been found in high concentrations in waste sludge. Degradation products of APEOs, alkylphenols and APEOs 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.

Brominated flame retardants
Flame retardants are used in order to retard or prevent a material from catching fire. Some flame retardants are toxic to health and the environment. Some are also suspected endocrine disruptors. There are about a hundred different flame retardants, of which around 70 contain bromine, and are the most controversial. Brominated flame retardants may leak out during use and disposal, they are slow to degrade in nature, and they are accumulated in organisms and are toxic. They can be transported over long distances.

The use of a number of brominated flame retardants is already prohibited by law.

Phthalates
Phthalates are found in construction products such as PVC floors, flexible hoses and plastic pipes, paints and varnishes, grouting, insulation materials, window and door sealants and protective tape and film[129]. 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 and are therefore undesirable in ecolabelled products for many reasons.

The EU Candidate List includes 13 phthalates. Four of these (DEHP, DBP, BBP and DIBP) are also included in the EU's authorisation list, which entails that their use will be prohibited as from 21 February 2015 unless authorisation of use for a specific purpose has been achieved. However, the prohibition solely concerns these four phthalates in chemical products that are imported to or produced in the EU, and in items produced in the EU. Phthalates in imported products are thus not subject to the prohibition.

The phthalates included in the Candidate List are also found on the Swedish Chemicals Agency's PRIO list as phase-out substances. The substance diallyl phthalate is also included, as it is environmentally hazardous and may have adverse long-term environmental effects.

Five phthalates (DEHP, DBP, BBP, DINP and DIDP) have been risk assessed within the EU and in 2010 ECHA reviewed new data for these substances, and for DNOP[130].

The phthalates dicyclohexyl phthalate (DCHP), dihexyl phthalate (DHP) and diethyl phthalate (DEP) are found on the EU's priority list of potential endocrine disruptors.

Some phthalates can be found on the Danish "Listen over Uønskede Stoffer (List of undesirable substances). These include: di-2-ethylhexyl phthalate (DEHP), dibutyl phthalate (DBP), butyl benzyl phthalate (BBP) and dimethoxyethyl phthalate (DMEP). The Danish list previously also included diisobutyl phthalate (DINP). This has now been

[129] Kartläggning av ftalater i varor, Kemikalieinspektioner (Investigation of phthalates in products, Swedish Chemicals Agency). PM 2/2014.
[130] Danish Environmental Protection Agency, 2013.

removed, since it is not classified as toxic to reproduction, although suspicions remain that it may be an endocrine disruptor.

As a precaution, Nordic Ecolabelling has chosen to continue to exclude phthalates as a group, since this group includes many different phthalates with various different characteristics. Nordic Ecolabelling is aware that this entails that several of these phthalates are excluded by both the CMR requirement and the requirement concerning candidate list substances, but still considers it important to highlight phthalates in this requirement. As in version 2 of the criteria, the basic requirement is a prohibition of phthalates, supplemented with a prohibition of certain phthalates in sealants. Successful substitution in industry has shown that there is no need for any differently worded prohibition of phthalates in sealants, but that it is now reasonable to require that sealants are also free of any phthalates.

Heavy metals
The heavy metals listed are known environmental toxins of which use should preferably be discontinued, or at least significantly restricted.

Volatile aromatic compounds
Volatile aromatic compounds are a large group of compounds of which many have adverse health or environmental effects.

Bisphenol A
Bisphenol A is a monomer in the production of polycarbonate plastics (PC) and in epoxy resin. Bisfenol A is used in a various range of products such as baby bottles, tins and plastic pipers for the building industry.

Bisfenol A (Cas. Nr:80-05-7) is classified as toxic for reproduction – H361f (R62), STOTS SE 3 with H335, Eye Dam. 1 with H318 and Skin Sens 1 with H317.

Bisphenol A is included on the 2009 "effect list from the Danish Environmental Protection Agency, a list of undesirable substances, and on the EU's list of endocrine disruptors.

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 Eye Irrit. 2 with H319, Skin Irrit. 2 with H315, Skin Sens. 1 with H317 and Aquatic Chronic 2 with H411. 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.

Boric acid, sodium perborate, perboric acid and sodium borate (borax)
Boron compounds may occur in timber preservatives and textiles (as flame retardants in natural fibres) and may be used in the production of glass and ceramics.

Boric acid, borates and perborates are classified as reprotoxic, Repr. 1B. Boron compounds are also phytotoxic (toxic for plants), which may be significant if we expect spreading to the soil or the environment. Boric acid and a borate compound are also on the Candidate List.

Organotin compounds

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[131], 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 Swan 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[132].
- Dibutyltin (DBT, 1002-53-5) is usually self-classified as H302[133.]
- Triphenyltin (TPT, 668-34-8) is usually self-classified as H301, H311, H331, H400 and H410[134].
- 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[135].

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

Appendix 9 Nanoparticles

In the product group Chemical building products, it has proven extremely challenging to set requirements concerning the content of nanoparticles. A range of different ingredients go into chemical building products and it is difficult to maintain an overview of all the different constituent components and their size. Many of the traditional ingredients in chemical building products contain particles of nano size and are considered as nanomaterials under the European Commission's recommended definition. There are also examples of traditional ingredients with a fraction of nanoparticles being produced with an even greater level of ultrafine particles than before, and of the particles in many cases also having 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[136]. The new nanomaterials are used to give the products new properties depending on particle size. The particles are increasingly being surface treated to prevent them agglomerating when added to a product. These are the findings in the 2010 report "Nanoteknologiske overflader og nye kvalifikationskrav (Nanotechnological surfaces and new qualification requirements) by the Danish Technological Institute[137]. According to the report, it is necessary to modify the surface of nanoparticles, in order to stabilise and disperse the particles in water, polymers or some other solution. The stabilisation and dispersal of nanoparticles is achieved using various chemical modifiers (particle coatings), which span a broad spectrum from hydrocarbons and alkoxysilanes to phosphates, sulphonates and quaternary ammonium compounds.

Nanoparticle exposure in chemical building products

There have been several risk assessments of nanoparticles in paints, lacquers and sealants, including through NANOKEM and NanoHouse. "NANOKEM - Nanopartikler i farve- og lakindustrien. Eksponering og toksiske egenskaber (Nanoparticles in the paints and lacquers industry. Exposure and toxicity) is a Danish project financed by the Working Environment Research Fund[138]. The timeframe for the project was 2007-2011, but articles were also published through this project in 2013. The main focus of the project was on the release of nanoparticles and their health effects when sanding paints and lacquers. The NanoHouse collaborative project is funded by the European Commission through Framework Programme 7 "Activities towards the development of appropriate solutions for the use, recycling and/or final treatment of nanotechnology-based products[139]. The project began in January 2010 and has now been completed (January 2014). This project looked at the release of nanoparticles due to mechanical wear and weathering.

Both the NANOKEM and the NanoHouse projects show that wear on paint does not lead to the release of free nanoparticles, with the nanoparticles instead remaining locked into the released paint particles.

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136 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

137 H. V. Kristensen et al, Nanoteknologiske overflader og nye kvalifikationskrav, Danish Technological Institute, 2010

138 Website for the NANOKEM project: http://www.arbejdsmiljoforskning.dk/da/projekter/nanopartikler-i-farve-og-lakindustrien---nanokem (06.01.14)

139 Website for the NanoHouse project: http://www-nanohouse.cea.fr/scripts/home/publigen/content/templates/show.asp?P=55&L=EN&ITEMID=2 (06.01.14)

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)[140]. It is, however, not entirely clear whether it is nano-TiO_2 that is released or larger TiO_2 particles. The research also shows that the photocatalytic effect is reduced during ageing, although no reason is given to explain this. A European Commission report from 2012 (see ref. 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[141]. 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[142]. The carbon black used in paint is very finely ground and has a particle size of around 10-30 nm[143]. 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[144], 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 must be of nano size for it to be deemed 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 Swan Ecolabelled chemical building products.

There are many organic pigments that may comprise or contain fractions of nano-particles. Examples of such pigments are: pigment yellow 1, 13 and 83, pigment orange 5 and 34 and pigment red 3[145].

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.

[140] J. Olabarrieta et al, Agening 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
[141] Coatings Handbook; Thomas Brock, Michael Groteklaes, Peter Mischke; 2000
[142] Industrial Organic Pigments; W. Herbst, K. Hunger; Third edition 2004; pp 120-124
[143] Coatings Handbook; Thomas Brock, Michael Groteklaes, Peter Mischke; 2000; p 128
[144] Email correspondence with the SHE Director at Kronos International, INC, 12.11.12
[145] W. Herbst, K. Hunger, Industrial Organic Pigments, Third edition 2004

Surface-modified colloidal silica is permitted.

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 are, however, permitted. Pigments are exempted from the requirement, such that TiO_2 may be used in pigment form.

It can be difficult to find out the particle size of inorganic fillers from raw material suppliers. Naturally occurring inorganic fillers such as chalk, marble, dolomite and lime are exempted from registration under Annex V, point 7 of REACH, as long as these fillers are only physically processed (ground, sifted and so on) and not chemically modified. They are also exempted from registration in the Danish Environmental Protection Agency's draft Regulation on a register of blends and goods that contain nanomaterial and the duty of producers and importers to update the register[146].

Article 2(7)(b) of the REACH Regulation (1907/2006/EC[147]) states that 7.

The following shall be exempted from Titles II, V and VI:
(Title II relates to registration of substances, Title V relates to downstream user and Title VI relates to 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):

7. 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.

Inorganic fillers are exempted from the requirement as long as they are covered by Annex V, point 7 of REACH.

Polymer dispersions are also exempted from the requirement. The European Commission's report[148] to accompany the second Regulatory Review on Nanomaterials from 2012[149] states that solid nanomaterials in the dispersant in a liquid phase (colloid) are to be considered nanomaterials in accordance with the European Commission's recommendation. Nanoemulsions are not, however, covered by the definition. Polymers/monomers may occur in different phases and sizes, and the choice has therefore been made to explicitly state that polymers are exempted from the definition.

[146] Link to the Danish Environmental Protection Agency hearing: http://hoeringsportalen.dk/Hearing/Details/16910 (visited 20.01.14)
[147] Link to REACH: http://eur-lex.europa.eu/LexUriServ/site/en/oj/2006/l_396/l_39620061230en00010849.pdf
[148] 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
[149] 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
Website of DaNa: http://nanopartikel.info/cms

Appendix 10 Quality management in the building regulatory system

The appendix is written in the Scandinavian languages and may be obtained from Nordic Ecolabelling: Sara.bergman@svanen.se

Appendix 11 Requirements that have been discussed, but not included in the revision

The following proposed requirements were discussed and investigated during the revision process. For various reasons, Nordic Ecolabelling has decided not to include them in the consultation proposal.

Point requirements to reward shared saunas

In Finland, it is customary to build saunas, and there is an environmental benefit from rewarding the construction of shared, bookable saunas, instead of a sauna in each flat of an apartment building. The opportunity for one (1) point, provided that the shared sauna has automatic controls so that it is not heated when it is not in use, is subject to investigation, but it has been decided not to include it in the consultation proposal.

Point for minimisation of electrical heating for de-icing

A proposal for one (1) point for control of moisture and temperature in heating cables for driveways, loading bays, drainpipes, gutters and so on, has been discussed. The requirement is of direct environmental relevance, as control/automation reduces the energy consumption when heating cables must be used.

The proposal is environmentally relevant, but this is a "narrow" requirement, i.e. not especially general. Like the sauna requirement, the requirement can also be criticised, since it does not reward the most environmentally optimised solution, which is to design the building so that energy for de-icing is not required at all.

Requirement to report measured energy consumption

Studies show that measured energy deviates from estimated energy both for conventional new production and for low-energy buildings. Comparison of low-energy buildings in Sweden showed that for almost 40% of the buildings, the measured energy performance exceeds the estimated performance[150]. The differences can be related to user behaviour (ventilation behaviour, higher indoor temperatures and higher domestic hot water consumption), but also to errors in the estimates, such as percentage rates for thermal bridges and HWC losses instead of the estimates, etc.

This question is relevant in all Nordic countries, although Sweden is the only country that bases its approval/building laws on measured, rather than estimated, energy consumption. To handle this issue/challenge, Nordic Ecolabelling has discussed the possibility of requiring that energy consumption must be reported after a certain time (e.g. two years after occupation). A drawback of such a requirement is there is a statutory requirement in Sweden and that properties are often built and then sold to an external party. Often, the client (builder) will be the licensee, and not the property owner, and requiring a report after a certain time has elapsed is not very manageable.

Air humidity

Very low relative air humidity (down to 10%) has been measured in Norway, especially in cold winters. Wooden floors should not be exposed to lower air humidity than approximately 20%. Very low air humidity is not good for the health either.

[150] Sammanställning av lågenergibyggnader i Sverige (Comparison of low-energy buildings in Sweden), LÅGAN (programme for low-energy use buildings) 2013

Wind-resistant construction

Wind-resistant construction is a way of handling generally windier weather due to climate changes. In coastal areas of Norway and Sweden, wind-resistant construction has long been the norm. A requirement for wind-resistant construction would solely concern outer walls of wood and should not drive costs.

Electromagnetic fields

Magnetic fields are not a problem in homes where high amperage is required. On the other hand, higher electromagnetic fields (EMF) can be measured in homes. The strength of the electromagnetic field diminishes with the square of the distance. A normal threshold value in many countries is 5000 V/m at a frequency of 50 Hz. This value is based on the force required to contract a frog muscle. WHO has classed low- and high-frequency fields as potentially carcinogenic. However, cause and effect in relation to electrical fields are difficult to map.

Stray currents can be handled with five-wire systems, but this does not resolve the problem with high electromagnetic fields.

Nordic Ecolabelling has discussed the area but decided not to introduce a requirement concerning electrical fields in this version.

Legionella

The occurrence of legionella is assessed to be covered by national legislation.

Social requirements concerning rock materials

Even though it is relevant to set requirements for the observance of fundamental human rights when rock materials are quarried, Nordic Ecolabelling has decided not to include this. The reason is that materials requirements are already numerous and complicated to verify.

Requirements of materials in contact with drinking water

Questions concerning limitation of lead in contact with food products (drinking water) were examined in the consultation. Water tap manufacturers are working intensively to reduce and even completely eliminate lead in brass alloys. This work presents major quality challenges, however. The connection is not so simple either that a lower content of lead in the alloy entails lower lead concentrations in the drinking water supply, as this can also be exactly the opposite.

On this basis, Nordic Ecolabelling has chosen not to prepare requirements to limit lead in material in contact with drinking water. The question will be considered again, however, in conjunction with the next revision.